Challenges of Reforming the Welfare State

Four Essays on the Impact of Institutional Reforms on Individuals in Germany

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1 Introduction

The German social insurance system has a very long tradition, the national health insurance, the first pillar of the social insurance system was introduced in 1883.The social insurance system was subsequently amended by a statutory accident insurance (1884), a statutory pension system (1889) and unemployment insurance (1927). When the Federal Republic of Germany was founded in 1949, its constitution explicitly stated that Germany was a welfare state under the rule of law (Articles 20m and 28). This welfare state principle, however, did not define the specific institutions of the welfare state. The task of defining the institutional rules of the welfare state was left subsequent to the governments. The institutional design of the welfare state and its reforms is consequently the topic of on-going political debate.

This paper focuses on two elements of the welfare state: the public pension scheme and unemployment insurance. The public pension scheme in Germany is organized as a Bismarckian Pay-As-You-Go system (PAYG). Current employees pay the pensions of current retirees. In contrast to a funded pension scheme, employees do not accumulate capital in a PAYG system. The same is true of unemployment insurance. Socially insured employees have to pay contributions. The contributions are used to finance payments to those currently unemployed. The level of unemployment benefit is subject to changes as political preferences vary over time.

The social insurance system is financed by taxes and duties, which induce economic welfare losses [e.g. Kay (1980)] and may reduce competitiveness in a globalized economy [e.g. Janeba (1995)]. Political decision-makers also have to consider the negative effects of the social welfare state. Moreover, the fiscal burden of a PAYG pension system critically hinges on the dependency ratio. A shrinking labour force and the increasing number of recipients of social transfers resulted in the need to adjust the social security systems in Germany [e.g. Börsch-Supan and Schnabel (1998)]. After years of a wait-and-see strategy [keyword “Die

Rente ist sicher"], political decision-makers realized the problems of demographic change and the challenges of global competitiveness. As a result, both the public pension scheme and unemployment insurance were reformed at the beginning of this century. These changes in both social security systems were the most dramatic since the founding of the Federal Republic of Germany in 1949.

The public pension scheme was modified in several ways. The sustainability factor was introduced into the benefit formula of the pension system. The Riester-Reform subsequently promoted private pension schemes[1] [see Börsch-Supan et al. (2003) for details]; and, finally, the retirement age was increased [see Ehrentraut and Heidler (2008)]. These reforms may help to stabilize the public pension system by decreasing expenditure and increasing revenues. Current studies indicate that the pension level will decrease in the future [German Council of Economic Experts (2007)] and that expenditure will decrease as a result compared to a scenario without these reforms [Bucher-Koenen and Wilke (2008)].

The changes in unemployment insurance introduced with the so called Hartz-Reforms (these changes came into effect between 2003 and 2007) were the most substantial since the implementation of unemployment insurance. The long-term unemployment benefit, formerly a wage-dependent benefit, was reduced to a wage-independent subsistence level. Moreover, the time limit for receiving short-term unemployment benefit was reduced significantly. The Hartz-Reforms aimed to create incentives to work and to increase the competitiveness of the German economy [Burda and Hunt (2011)]. Today both objectives, namely stabilising social security financing and increasing the competitiveness of the German labour market, are considered to have been achieved [German Council of Economic Experts (2008), German Council of Economic Experts (2007)].

[1] These private pensions are subsidized. The provisions made via private pension schemes decreases the value of the public pension.

1 Introduction

The reforms of the German public pension scheme and unemployment insurance affected the situation of individuals and prompted them to change their behaviour. This raises several research questions. Was the risk of old-age poverty increased due to the reforms? To what extent does skill level, gender or marital status affect the risk of old-age poverty? Have the Hartz-Reforms affected wage setting, and therefore the competitiveness of the German economy? Do households adapt their saving behaviour due to their expectations, and have the Hartz-Reforms affected this saving behaviour? These issues are examined in detail below. After analysing the risk of old-age poverty in Germany (sections two and three), we examine the impact of the Hartz-Reforms on individual wages in section four. Our analysis concludes with an examination of the impact of individual (income and unemployment) expectation on the saving behaviour of households in section five.

1.1 Summary

In sections 2 and 3, we analyse changes in old-age income risk in Germany due to changes in employment patterns and institutional reforms. We find that the risk of old-age poverty will increase for almost all new pensioners in 2020-2022 compared to new pensioners in 2004-2006. These analyses discuss differences in the incidence of old-age poverty by sex, skill and marital status. We focus on the statutory pension scheme because it is currently the most important source of income for retirees in Germany. In 2007, statutory pensions accounted for over 90% of old-age income in Eastern Germany and about 80% in Western Germany [see Heien et al. (2007)].

In the German PAYG system, the pension claim is proportional to the socially insured life-cycle labour income; therefore the higher the overall individual labour income, the higher the individual pension. Due to increasing disruptions in employment biographies since the 1970s, mass unemployment in Eastern Germany since the 1990s, and the structural reforms of the

German social security system, there is a growing fear of post-retirement poverty in Germany. Our analyses help to answer the question of whether this fear is justified or not. The increasing disruptions in employment biographies and mass unemployment in Eastern Germany decrease pension claims due to missing years in employment. Moreover, the recent structural reforms of the German social security system lower the monthly pension claim in three different ways. Firstly, the pension claim for the long-term unemployed is decreased significantly. Secondly, pensions are explicitly linked to demographic developments and the share of private pension schemes. The higher the share of pensioners relative to socially insured workers, the lower the individual pension. Thirdly, in order to reduce the cost of social security, statutory pension claims are lowered.

Section 2 presents a micro-simulation model to compare the distribution of statutory pension claims for new retirees in 2020-2022 and the claims of new retirees in 2004-2006. The pension claim distribution is calculated separately for Eastern and Western Germany, for men and women, and for low, medium and high skilled persons. Throughout Germany, growing post-retirement poverty can be observed, especially among low-skilled workers. The share of affected low skilled males dramatically increases in Eastern Germany from 4% to 53% (Western Germany: 28% to 45%). Moreover, Eastern Germany will lose its current low inequality in terms of pension income distribution and its higher public pension level compared to Western Germany. More specifically, the mean pension claim of males will decrease by about 16% in Eastern Germany, whereas it will stay constant in Western Germany.

In section 3, the micro-simulation is modified to analyse the most common types of household with respect to marital status, and the analysis focuses on households instead of individuals. As in section two, education is the key to a sufficient statutory pension in both parts of Germany. In general, the probability of old-age poverty increases for all types of households

between 2004-2006 and 2020-2022. Nevertheless, specific groups like, for example, widows or couples where both individuals are high skilled are much less affected. Our findings help to clarify the risk of post-retirement poverty for specific household constellations. The overall old-age poverty risk of two-person households is significantly lower than for a single person household.

What are the political implications of the increasing old-age poverty risk in Germany? First of all, both society and political decision-makers should be aware of growing old-age poverty in the future and must find ways of protecting themselves against the old-age poverty risk. Due to the characteristics of a PAYG pension system, political decision-makers have to improve labour market participation, especially among low skilled workers and (Western German) women in order to avoid post-retirement poverty. Advanced training is a long-term instrument to increase the skill level of workers and to improve their employment outlook. Nevertheless, additional instruments are needed and become more important in the future to avoid old-age poverty in the short and medium term, e.g., a minimum pension. Moreover, employees have to complement their statutory pensions with private as well as occupational pension schemes.[2] Nevertheless, employees with a small labour income and/or long periods of unemployment are unlikely to offset their old-age poverty risk via private pension plans.

Section 4 takes a closer look at the impact of the Hartz-Reforms on wages. Theory predicts that the level of unemployment benefits affects the wage [e.g. Rogerson et al. (2005)]. A decreasing unemployment benefit should have a lowering effect on wages. Using the Hartz-Reform as a quasi natural experiment, we analyse this linkage. For most workers the reform meant a decrease in both their long-term and their short-term unemployment benefit. We use panel data to estimate the effect of the structural break on wages and find strong evidence that

[2] Coppola (2008) provides evidence for an increasing number of people with private or occupational pension plans between 2003 and 2007.

the decrease in unemployment benefit lowered wages. After the reform, the wages for men decreased c. p. by up to 2%. For women the decrease was even slightly higher. Moreover, the lowering effect of a lower unemployment benefit increases with the skill level.

Our findings show that the Hartz-Reform induced wage restraint and may also be partly responsible for the favourable labour market situation in Germany [German Council of Economic Experts (2011)]. The Hartz-Reform also increases the flexibility of the German labour market. Moderate wage setting and labour market deregulation improved the situation for capital investments and increased the competitiveness of the economy [see Spector (2004)]. Thus, the labour market situation improved and employment increased [e.g Sinn et al. (2009), Klinger and Rothe (2012), Krause and Uhlig (2011)].

After analysing the effect of institutional reforms on old-age income (sections 2 and 3) and wage (section 4), we examine the impact of unemployment and income expectations on the savings behaviour of households in section 5. Individuals may adapt their savings behaviour to the expected probability of becoming unemployed. A higher probability of unemployment decreases expected future income. Hence, when facing a lower expected income, individuals raise their savings in order to smooth their intertemporal consumption path. We examine whether households adjust their savings behaviour to a change in their individual unemployment, income and health expectations. In contrast to former studies, which often use proxies instead of individual expectations [e.g. Skinner (1988)], we use household based expectations. To this end, we use survey panel data on German household savings and expectations, the SAVE Panel. The findings suggest, in contrast to the theory of textbook models, that a higher unemployment expectation significantly decreases the (short-term) saving rate.

This result may be due to labour market legislation after the Hartz-Reforms, as private assets reduce long-term unemployment benefit. Unemployed persons have to liquidate

assets/savings (down to a given level) before they can apply for long-term unemployment benefits, they may adjust their savings when they expect to become unemployed.[3] We are not able to identify a significant relationship between general future income expectations and savings, but we show that both unemployment and health expectations affect the savings decision. Moreover, we find that good health expectations weaken the impact of the unemployment expectation. Thus, exogenous shocks in the labour market may affect the savings rates, and therefore the capital markets and investments. As a result, social security systems can avoid contagion effects.[4]

1.2 Contribution to the literature

Sections 2, 3 and 4 are based on articles written in co-authorship. "A Fragile Pillar: Statutory Pensions and the Risk of Old-age Poverty in Germany" (section 2) was published in 2010 in FinanzArchiv 4 (66). The co-author is Wolfgang Nagl, a PhD student at the Dresden branch of the ifo Institute. His contribution to the paper consists of the literature and legislation review, as well as the calculation of the (skill specific) pension point distributions for males. My contribution to the paper is the selection of appropriate datasets, the preparation of the data for the analysis and the calculation of the (skill specific) pension point distributions for females. The analysis is based on the IAB employment panel by the German Federal Employment Agency, as well as the VSKT 2005 (Versichertenkontenstichprobe 2005) by the Research Data Centre of the German Pension Insurance. The revisions of the paper taking into account the referees' suggestions were made by both authors.

[3] This linkage has to be examined by further research in detail.

[4] The same is true for a health care system, which may reduce uncertainty about the future health situation. Studies show that "the introduction of social health insurance can substantially reduce uncertainty about out-of-pocket health expenditure, and thus reduce" savings when a health insurance became available [Chou et al. (2003) p 1 892].

Section 3 builds on the article “Is There a Growing Risk of Old-age Poverty in Eastern Germany?”, which was published in 2009 in Applied Economics Quarterly Supplement 55 (60). The calculations of household pension point distributions in this paper are based on the pension point distributions of individuals, as used in section 2. My co-authors are Wolfgang Nagl and Prof. Dr. Joachim Ragnitz, Dresden branch of the ifo Institute. Prof. Dr. Joachim Ragnitz suggested the research question, supervised the working process and revised the paper. Wolfgang Nagl surveyed the literature and summarized the legislation. He also calculated of the pension point distributions for single-person households. As in section 2, my contribution to the paper is the selection and preparation of the data sets. Moreover, I calculated representative skill specific household pension point distributions using information from the Federal Statistical Office of Germany about partnerships of elderly persons. Later on I used the two-person household pension point distributions to calculate the pension point distributions for widows. The revisions of the paper taking into account the referees’ suggestions were made by W. Nagl and myself.

Section 4 presents the article “Unemployment Benefits and Wages: Evidence from the German Hartz-Reform” which is due to be published in the Journal of Economics and Statistics (Jahrbücher für Nationalökonomie und Statistik). This article was written by Wolfgang Nagl and myself. W. Nagl’s contribution to the research consists of the selection and preparation of the data, as well as the general regression analysis. My contribution to the paper consists of the literature and legislation review, as well as the sensitivity analysis of our findings. Revisions of the paper taking into account the referees’ suggestions were made by both authors. I amended and modified all published papers by adding more detailed descriptions (e.g. of the methodology) and by performing a language check.

1.3 References

Börsch-Supan, A. and R. Schnabel (1998), Social security and declining labor-force participation in Germany, American Economic Review 88 (2), 173-178.

Börsch-Supan, A., A. Reil-Held and C. B. Wilke (2003), Der Nachhaltigkeitsfaktor und andere Formelmodifikationen zur langfristigen Stabilisierung des Beitragssatzes zur GRV, *Sozialer Fortschritt* (11-12), 275-284.

Bucher-Koenen, T. and C. B. Wilke (2008), Zur Anhebung der Altersgrenzen: Eine Simulation der langfristigen Auswirkungen auf die gesetzliche Rentenversicherung bei unterschiedlichem Renteneintrittsverhalten, MEA Working Paper No. 08-44.

Burda, M. C. and J. Hunt (2011), What explains the German labor market miracle in the Great Recession?, NBER Working Paper No. 17187.

Chou, S. Y., J. T. Lui and J. K. Hammitt (2003), National Health Insurance and Precautionary Saving: Evidence from Taiwan, *Journal of Public Economics* 87, 1 873-1 894.

Coppola, M. (2008), Das Sparverhalten der deutschen Haushalte, *MEA Policy Brief* 5/2008, Mannheim Research Institute for the Economics of Aging, University of Mannheim.

Ehrentraut, O. and M. Heidler (2008), Zur nachhaltigen Finanzierung der GRV: der Beitrag der Altersgrenzenanhebung im Rentenreformprozess, Perspektiven der Wirtschaftspolitik 9 (4), 424-445.

German Council of Economic Experts (2007), Das Erreichte nicht verspielen – Annual Report 2007/08, Federal Statistical Office of Germany, Wiesbaden.

German Council of Economic Experts (2008), Die Finanzkrise meistern – Wachstumskräfte stärken – Annual Report 2008/09, Federal Statistical Office of Germany, Wiesbaden.

Heien, T., K. Kortmann and C. Schatz, (2007), Altersvorsorge in Deutschland 2005, *DRV-Schriften* Bd. 75, München.

Janeba, E. (1995), Corporate income tax competition, double taxation treaties, and foreign direct investment, *Journal of Public Economics* 56 (2), 311-325.

Kay, K. J. (1980), The deadweight loss from a tax system, *Journal of Public Economics* 13 (1), 111-119.

Klinger, S. and T. Rothe (2012), The Impact of Labour Market Reforms and Economic Performance on the Matching of the Short-term and the Long-term Unemployed. *Scottish Journal of Political Economy* 59 (1), 90-114.

Krause, M. U. and H. Uhlig (2011), Transitions in the German labor market: structure and crisis. *Deutsche Bundesbank Discussion Paper*, No 34/2011. 1-37.

Rogerson, R., R. Shimer, R. Wright (2005), Search-Theoretic Models of the Labor Market: A survey. *Journal of Economic Literature* 18, 959-988.

Sinn, H.-W., W. Geis and C. Holzner (2009), Die Agenda 2010 und die Armutsgefährdung. *ifo Schnelldienst* 17, 23-27.

Skinner, J. (1988), Income Risk, Life Cycle Consumption, and Precautionary Savings, *Journal of Monetary Economics* 22, 237-255.

Spector, D. (2004), Competition and the capital–labor conflict, *European Economic Review* 48 (1), 25–38.

Stephens, M. (2004), Job Loss Expectations, Realizations, and Household Consumption Behavior, *The Review of Economics and Statistics* 86 (1), 253-269.

2 A Fragile Pillar: Statutory Pensions and the Risk of Old-age Poverty in Germany[1]

by Stefan Arent and Wolfgang Nagl

2.1 Introduction

Many developed countries are facing a significant demographic change with a growing old-age dependency ratio. The ongoing aging process of many European societies raises the question of whether old-age incomes are secure. The OECD recently compared the situation of today's pensioners in its member states and found that 'old-age income poverty is common to most OECD countries' [OECD (2009, p.74)]. A shrinking labor force will have to support a growing number of pensioners, which is likely to result in an increasing risk of old-age poverty. The social reality of a shrinking labor force, which will have to support a growing number of pensioners, is likely to result in an increasing risk of old-age poverty. In Germany, the old-age dependency ratio will rise from 34 % in 2009 to 55 % in 2040 [Federal Statistical Office Germany (2009)].[2] Given the German Pay-As-You-Go (PAYGO) pension system, this situation will lead to lower pension levels and higher social security contributions. A significant body of research has examined old-age poverty risk. Most of the literature concentrates on average values and standard pensioners, but little is known about the entire distribution of pension incomes.

In addition to the challenges posed by demographic change, high unemployment is a problem [especially in Eastern Germany, see Berlemann & Thum (2005)] that also contributes to old-age poverty. Through disruptions in employment biographies, unemployment causes people to accumulate less entitlement in the statutory pension insurance. Unemployment also creates

[1] This chapter is published as "A Fragile Pillar: Statutory Pensions and the Risk of Old-Age Poverty in Germany" in FinanzArchiv 4 (66), 2010, 419-441.

[2] The old-age dependency ratio is the ratio of people older than 65 in 2009 and older than 67 in 2040 to the working population (20 - 65 in 2009 and 20 - 67 in 2040).

difficulties in saving for old age. Finally, the pension reforms, which have been instituted since the early 1990s, may have further increased the risk of old-age poverty.

These facts are well known, however the extent of the growth of old-age poverty risk is largely unknown. Focusing on the German statutory pension insurance, we calculate the distributions of benefits for people retiring in the years from 2020 to 2022 compared with those retiring in the years from 2004 to 2006. Distinct from the related literature, we disaggregate benefit distributions with respect to gender, vocational education level and place of residence (Eastern or Western Germany). In contrast to the Deutsche Rentenversicherung (2007) or OECD (2009), we focus on the distribution of pension points and illustrate the pension outlook across three skill levels. We also use a much larger dataset, and we generate more detailed statistical information about the distribution of pension claims with respect to gender, region and skill level.[3] Statutory pension should be a good approximation for the total old-age income for two reasons. First, for the vast majority of people, the benefit from statutory pension insurance is the most important component of old-age income.[4] Second, the lower an individual's income, the higher the ratio of statutory pension to his entire old-age income.[5]

The statutory pension will remain the most important source of old-age income for the next decades. Börsch-Supan et. al. (2008) state that, in 2040, the statutory pension will amount to 70% of the average old-age income. Moreover, there is no reliable data on occupational and private pensions.

[3] Deutsche Rentenversicherung (2007) is based on individual interviews and official data. The sample contains about 13,000 individuals from four age groups composed of 20 birth cohorts (1942 - 1961). Our dataset contains information from more than 100,000 individuals from two age groups composed of six birth cohorts (1939 - 1941 and 1955 - 1957).

[4] Deutsche Rentenversicherung Bund (2007) estimates that today statutory pensions account for over 90% of old-age income in Eastern Germany and about 80% in Western Germany.

[5] BMAS (2008) provides evidence that statutory pensions are the dominant source of old-age income for low-income earners.

Our analysis starts with a brief introduction to German statutory pension insurance in section 2.2. In section 2.3, we describe our approach and our dataset. The simulation results are presented in section 2.4. We discuss the results in section 2.5 with respect to critical assumptions and demographic facts. Section 2.6 concludes the chapter.

2.2 The German Statutory Pension Insurance

The German statutory pension insurance is a Bismarckian PAYGO system.[6] The monthly pension (MP) is determined by four factors, as described in the following equation:

$$MP = TF * PF * EPV * EP. \qquad (1.1)$$

The first factor on the right hand side is the Time Factor (TF), which is equal to one when a person retires at the legally determined age. Currently, the retirement age is 65 years and will increase to 67 by 2029. In the case of early retirement, the TF is reduced by 0.03% per month. Early retirement is feasible up to 60 months before the seniority set by law, so the maximum deduction is 18%. If a person decides to work beyond his legally determined age of retirement, the TF is increased by 0.05% per month. In the following analysis, we assume a TF equal to one. We do so for two reasons. Firstly we are interested in the ability of the German pension system to prevent old-age poverty and not in the effect of changes in early retirement. Secondly keeping the current average value of TF constant would just have level effects. Nevertheless we are aware of the early retirement issue and its impact on old-age poverty, and we discuss this problem in section 5.

The Pension Factor (PF) determines the monthly pension according to pension type. For the standard old-age pension, the pension factor is equal to one. It deviates from one for other

[6] A good introduction to the determinants and calculation methods in the German statutory pension system is provided by Breyer and Buchholz (2009).

pension types, such as a surviving dependent's pension or a disability pension. As we focus on old-age pensions, we assume PF to be equal to one. Individual earning points (EP) are calculated for each period t as a ratio of the annual gross salary of individual j ($IAGS_{ijt}$) and the mean annual gross salary ($MAGS_{it}$) in region i.[7] To obtain an individual's total EP, the EPs for all working years are summed up.

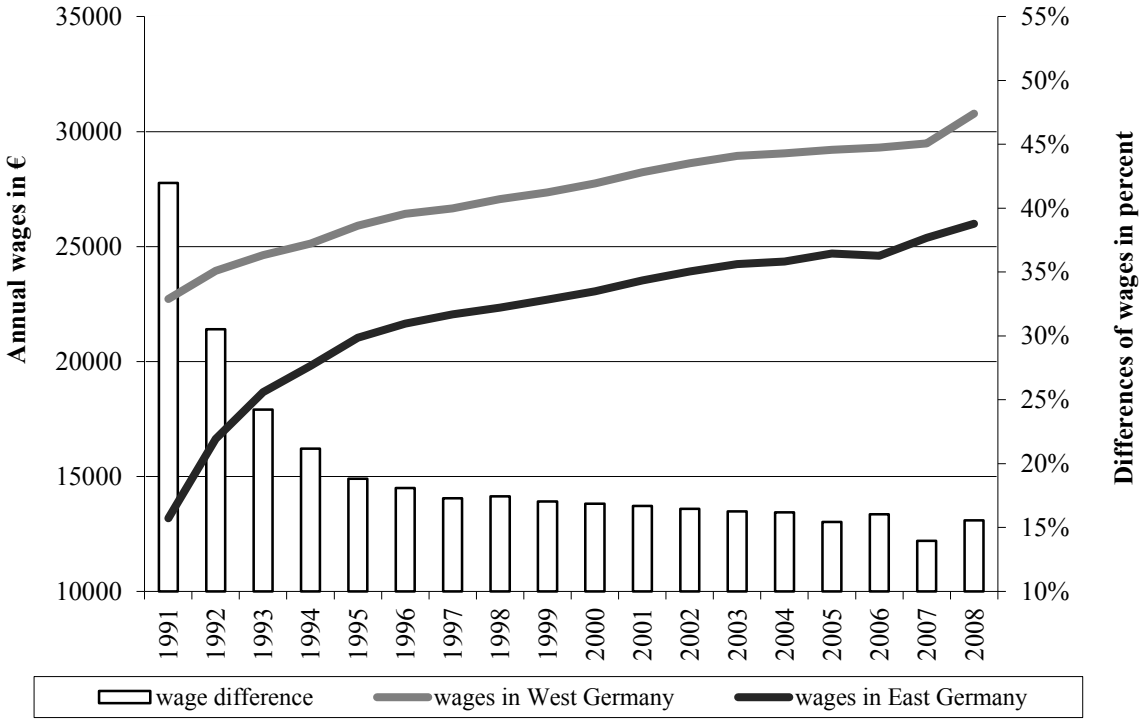
$$EP = \sum_{t=1}^{n} \frac{IAGS_{ijt}}{MAGS_{it}}, i = West, East. \quad (1.2)$$

Figure 1 shows the evolution of the mean wages in both parts of Germany. Wages in both parts of Germany grew continuously but the gap between Eastern and Western Germany did not decrease since the end of the 1990s. The upper limit is about 2.14 EP in every period t.[8] This limit is reached at 64.800 € in Western Germany and 54.600 € in Eastern Germany in 2009. Individuals also receive EPs while being unemployed. For short-term unemployment, EPs are calculated based on 80% of the most recent gross income. Long-term unemployed receive approximately 0.1 EP for one year of long-term unemployment.

[7] The individual incomes in Eastern Germany are also compared to the mean annual gross salary in Western Germany but are multiplied by a factor to compensate for the lower wage level in Eastern Germany.

[8] This upper limit is almost fixed because the assessment ceiling is adjusted every year in correspondence to the annual growth of the mean incomes. Deviations only occur because of one year lagged adjustments of the assessment ceiling.

Figure 1: Evolution of the Annual Average Gross Salaries



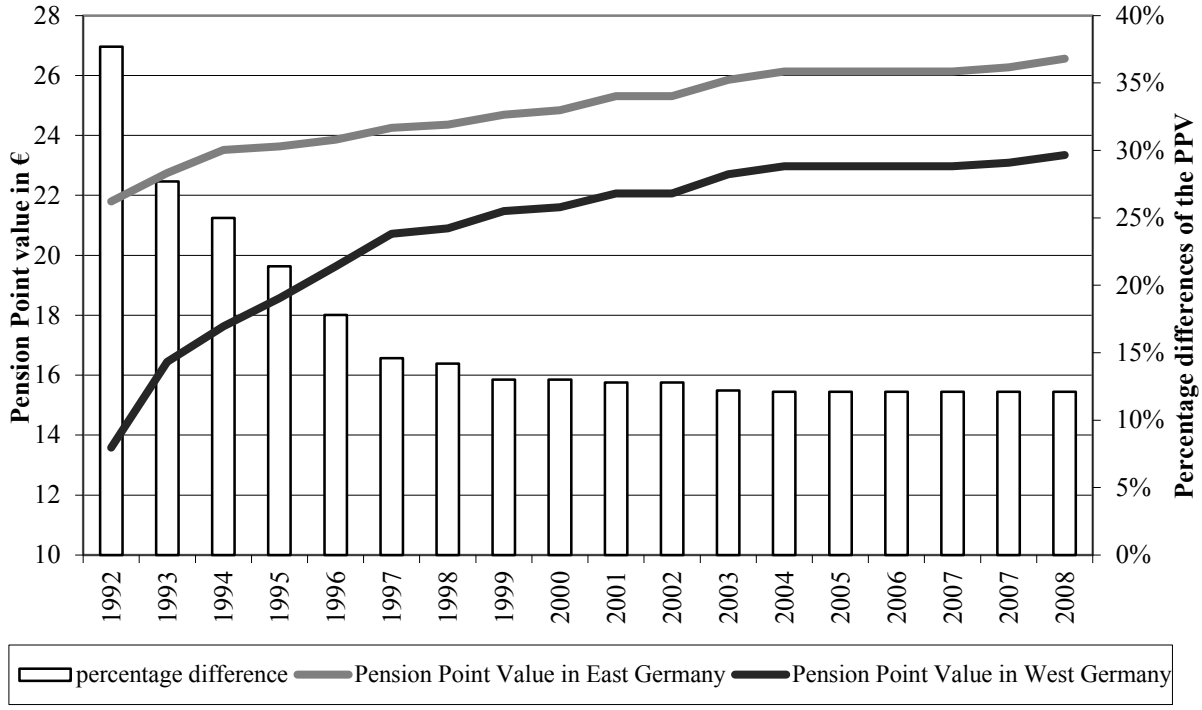
Source: authors' calculation

The Earning Point Value (EPV) translates the EPs into monetary values. The EPV is calculated every year for Western and Eastern Germany separately, as long as there are differences in income between Western and Eastern Germany. The EPV is determined through a demographic factor, the growth rate of wages and the contribution rate of the statutory pension insurance.[9] The evolution of the EPV_W and EPV_E are presented in Figure 2. In 2009, the EPVs were 27.20 € in Western Germany (EPV_W) and 24.13 € in Eastern Germany (EPV_E). In the following analysis, we keep the EPVs constant to facilitate the comparison of pensions across cohorts. Note that variations in the EPV would have level

[9] The growth rate of the EPV in Eastern Germany (EPV_E) must be at least as large as the growth rate of the EPV in Western Germany (EPV_W). This restriction is due to the intended adjustment from the EPV_E to EPV_W. Besides this adjustment restriction, a positive growth restriction is also set by law. The growth rate of the EPVs must be strictly non-negative.

effects, but would not affect the distribution. We discuss the impact of variations in the EPV on old-age poverty in section 5.[10]

Figure 2: Evolution of EPV_W and EPV_E



Source: authors' calculation

2.3 Methodology

Our aim is to compare the distributions of accrued EPs in the German statutory pension insurance for two cohorts. We consider new pensioners in the years 2004 to 2006 and new pensioners in 2020 to 2022. For simplicity, we assume that all people receive old-age pensions and retire at their legally determined age of retirement.[11] As mentioned above, we keep the EPV constant.

[10] In addition to the basic calculation methods presented here, there are many specific rules that enter the calculation of pensions for certain groups. One of the most important groups is employees in the mining industry. For this group, there are three main differences. First the pensionable age for miners is 60, rising to 62 by 2024. Second, it is possible for miners to gain more than 2.14 EPs a year. Third, the PF is 1.33.

[11] We account for the gradual increase of the seniority set by law to 67 until 2029.

To obtain a more detailed picture, we classify people according to their education, distinguishing between three skill levels. A person without vocational training, is classified as low skilled. A completed vocational training is regarded as a medium skill level, and an academic degree is the criterion for a classification as high skilled. In addition, we carry out separate analyses for men and women as well as for Eastern and Western Germany.

The dataset, which allows us to reconstruct individual working careers and to distinguish between age, gender, qualification and residence, is the IAB employment sample 1975-2004 - regional file (IABS-R04) from the German Institute for Labor Market and Job Research (IAB). This dataset contains a two percent sample of all workers registered in the German social insurance system.[12] To our knowledge, we provide the first analysis using the IABS - R04 to calculate individual monthly pensions. Table 1 and Table 2 show the distribution of skill levels for Western and Eastern Germany, respectively. Whereas the fraction of high skilled men and women in the old cohort is significantly larger in Eastern Germany, there are more high skilled men but fewer high skilled women in Western Germany in the young cohort.

Table 1: Skill Eastern Germany

	1939-1941		1955-1957	
Qualification	Male	Female	Male	Female
Low	3.1%	7.1%	1.7%	2.5%
Medium	77.2%	79.3%	83.3%	80.7%
High	15.7%	10.1%	12.8%	14.3%
Not Known	4.0%	3.6%	2.0%	2.5%
Total Quantity	3335	4128	5163	5396

Source: authors' calculation

[12] Drews (2008) gives a detailed description of this dataset.

Table 2: Skill Western Germany

	1939-1941		1955-1957	
Qualification	Male	Female	Male	Female
Low	15.8%	26.3%	8.0%	11.9%
Medium	74.3%	67.2%	74.7%	75.8%
High	7.5%	3.3%	16.3%	10.6%
Not Known	2.4%	3.2%	1.0%	1.7%
Total Quantity	18639	13903	27525	25271

Source: authors' calculation

All information in the IABS - R04 is given as spell data. Every spell contains information about individual incomes on a daily basis. In addition to working biographies, spells of unemployment are also included. The IABS - R04 provides information from 1975 to 2004 for Western Germany and from 1992 to 2004 for Eastern Germany.

Because of the spell structure of the dataset, we have to review and edit the dataset to determine an individual's annual income. We specifically concentrate on individual income and education. To review skill levels we convert the spell structure of the dataset into a panel structure. As a first step, we transform the original spell information for every individual into annual information.[13] We then calculate in a second step individual annual income. Because of the missing income information in cases of unemployment, we calculate the individual unemployment benefit as well as the unemployment aid with respect to the applicable regulation. After completing the individual income information, we calculate the EPs for every person in the sample.

To achieve reliable results, we eliminate some entries from our dataset. First, a person must be registered for a minimum of five years in the IABS-R04. This five year period is necessary because people with less than five years are likely generating their pension rights in other

[13] The length of a spell is determined by the length of the individual status signal and not by a standardized time frame (e.g., annual base).

systems.[14] For example, civil servants in Germany are secured by a separate pension system. The self-employed are another group that is outside of the statutory pension insurance system. Note that some civil servants and self-employed may be included in the sample if they were insured in the statutory pension insurance for more than 5 years. Finally we neglect mortality so we condition the analysis on individuals reaching the retirement age.

As the IABS - R04 dataset only contains information for the period of 1975 – 2004 and 1992 - 2004 for Western Germany and Eastern Germany, respectively, we have to make plausible assumptions about the employment history and the future employment career until the retirement age. The first gap to fill is the time up to 1975 and 1992, respectively. For example, a person from Western Germany born in 1939 was 36 years old in 1975. If this person started working at the age of 20, 16 years of working time (1959 - 1975) are missing in the IABS-R04. We solve this problem by using a second dataset [SUF FDZ-Biografiedatensatz - VSKT 2005 Source: FDZ-RV (VSKT 2005)] with similar information to complete the missing time periods. This dataset is a 0.2% sample of all workers registered in the German social insurance system between the age of 15 and 67.[15]

To combine both datasets we first divide the VSKT 2005 into 24 sub-groups according to education (high, medium, low), age (cohort 1939 - 1941 and 1955 - 1957), residence (Eastern and Western Germany) and gender (male and female). Second we sum the individual's EPs until 1975 (Western Germany) and 1992 (Eastern Germany). Finally, we examine the empirical distribution of all 24 sub-groups. Table 3 provides a summary of the characteristics of the 24 distributions. To combine the IABS-R04 with the VSKT 2005, we have to enlarge the VSKT-2005 data using a bootstrap technique. In a last step, we combine the two datasets.

[14] Another reason for the 5 year restriction is that the German statutory pension insurance only pays out pensions after 5 years of contributions.

[15] A detailed description of the VSKT 2005 can be found in Deutsche Rentenversicherung (2008) and Stegmann (2009).

Every person in the IABS-R04 receives a random EP drawn from the EP distribution given for his individual characteristics (skill, cohort, residence, gender).[16]

Table 3: Descriptive Statistics of the 24 VSKT 2005 Sub-groups

			Western Germany		Eastern Germany	
			Male	Female	Male	Female
1939 -1941	High	Mean	12.01	7.39	40.97	31.76
		std.	5.16	5.72	4.72	7.04
	Medium	Mean	15.48	8.01	38.29	24.27
		std.	5.00	4.58	6.36	7.26
	Low	Mean	13.88	6.63	34.47	11.66
		std.	6.93	4.70	7.94	4.05
1955 -1957	High	Mean	0.23	0.10	14.57	12.73
		std.	0.53	0.33	5.24	3.09
	Medium	Mean	0.71	0.64	15.15	12.41
		std.	0.69	0.66	3.38	2.68
	Low	Mean	1.23	1.23	12.82	11.66
		std.	0.97	0.97	4.57	4.05

Source: authors' calculation

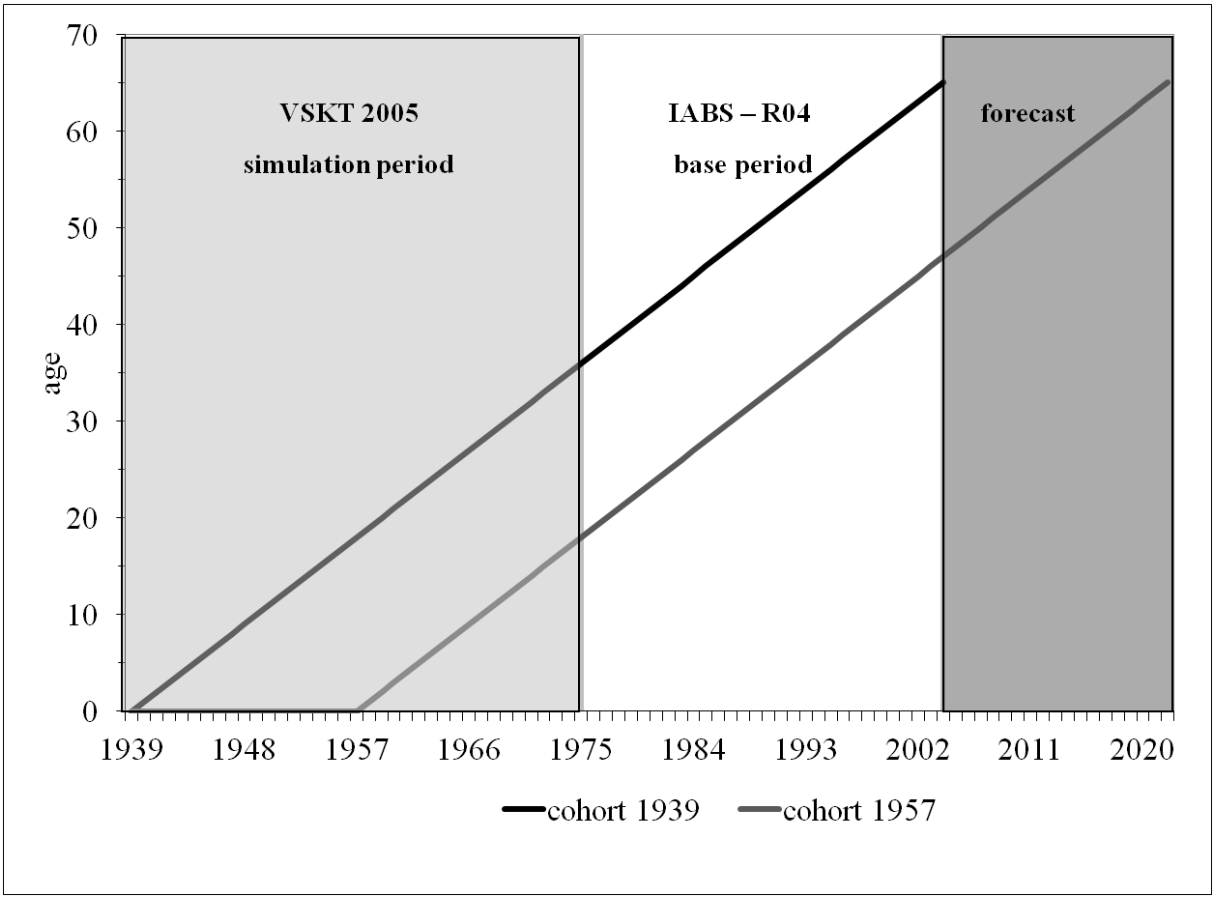
The second gap to fill is the time until retirement in 2020 - 2022 for the young cohort (forecast period). Figure 3 illustrates the methodological approach for the oldest and youngest age-groups in Western Germany. We assume that every individual maintains his/her unemployment characteristics observed so far until he/she retires. We calculate the fraction of employment, short-term unemployment and long-term unemployment relative to the total time in the IABS-R04 sample (base period) and apply these fractions to the time until the individual reaches the age of retirement.[17] To calculate the EP in the forecast period, we use the current labor market legislation with respect to unemployment spells. An alternate

[16] We also calculated this simulation period with average values. We calculated the average EP per year worked for all 24 groups according to gender, education, region and year of birth. Both methods lead to almost identical average results. Since the empirical distribution method shows more realistic variations, we focus on this method in the following analysis.

[17] We classify a person as short-term unemployed when he/she receives unemployment benefits and as long-term unemployed when he/she receives unemployment aid.

scenario is calculated with the assumption that the Eastern German employment pattern converges to the Western German. The resulting differences are negligible.

Figure 3: Methodical Approach Using the Example of Western Germany



Source: authors' calculation

We calculate the EP distributions for the two cohorts (1939 - 1941 and 1955 - 1957) at their retirement age with respect to individual characteristics and the current law.[18] In the following analysis, we concentrate on the differences between the two cohorts of new pensioners. In a first step, we test whether the EPs of the different cohorts follow the same statistical

[18] We consider the increase of the retirement age until 2020 respectively 2022.

distribution using the Kolmogorov-Smirnov-test (K-S-Test) [Massey (1951)].[19] In a second step, we compare the relevant statistical characteristics of the EP distributions, in particular the median and mean of the cohorts. We use the Mann-Whitney-U-Test (M-W-U-Test) and Mood's median test (M-M-Test) [Siegel (1957)].[20] If there is a variation over time, the tests identify differences in the mean and median of both cohorts.

2.4 Results

In this section, we provide a detailed analysis of the two cohorts regarding their financial situation in the statutory pension system. There is a widely held belief that Germany will face old-age poverty in the near future. Therefore, we ask whether there is a growing risk of old-age poverty and whether there are specific differences between the two parts of Germany. We also discuss the importance of the individual skill level and the differences between men and women.

2.4.1 Male pensioners

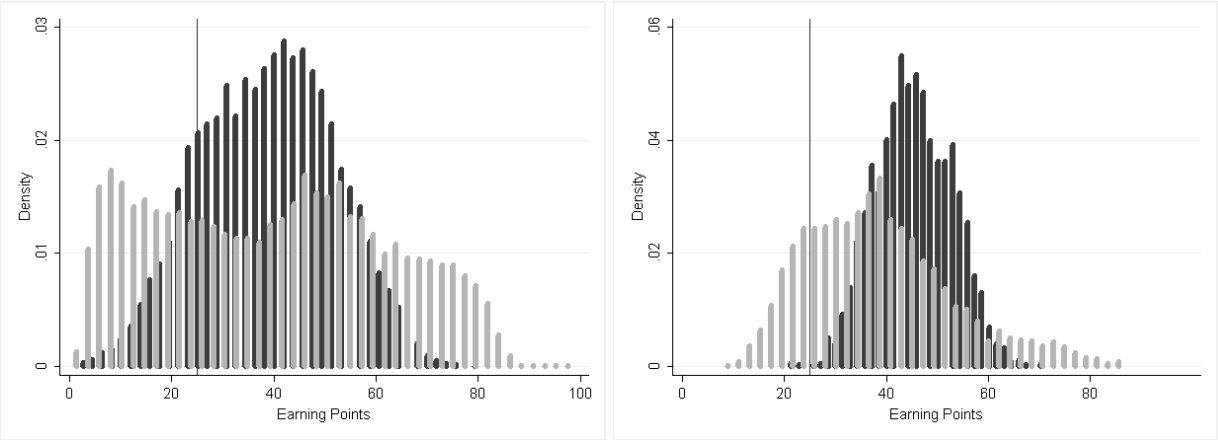
Figure 4 displays the EP distribution of men in Western Germany on the left-hand side and men in Eastern Germany on the right-hand side. The dark bars represent the accrued EPs of the 1939 to 1941 cohorts, and the light bars show the outcome for the younger cohorts. To assess the risk of old-age poverty, we assume a threshold of 25 EPs (Marked by vertical lines in the diagrams). In 2008, 25 EPs are equivalent to a monthly pension of 583.50 € in Eastern Germany and 664 € in Western Germany. We use this level as a critical threshold because it is

[19] The K-S-Test identifies if two i.i.d. samples are part of the same population. In the case of different populations, i.e. different distribution functions, the test should reject the hypothesis of an identical distribution. A p-value of zero implies different population distributions.

[20] The Mann-Whitney-U-Test is also a statistical test for assessing whether two i.i.d. samples come from the same population. The Mann-Whitney-U-Test allows further statements. The test identifies different means and medians. Mood's median test is used to confirm the results of the Mann-Whitney-U-Test.

nearly equivalent to the level of social assistance. In 2008 the means-tested benefit of needy persons over the age of 65 in Germany was 638 € [Federal Statistical Office Germany (2010)]. Our own calculations using federal data yields means-tested benefits of 614 € in Eastern Germany and 644 € in Western Germany. For simplicity we choose 25 EP as a proxy for both parts of Germany. We interpret our results focusing on two main issues: first, the comparison over time and second, the comparison of the two regions. In Eastern Germany, we observe a statistically significant decrease of the mean pension level and the distribution becomes more heterogeneous over time. Heterogeneity also increases in Western Germany.

Figure 4: Earning Point Distribution of Male Pensioners



	Western Germany		Eastern Germany	
	Western 39 -41	Western 55 -57	Eastern 39 -41	Eastern 55 - 57
25% percentile	29.05	19.47	40.10	27.71
50% percentile	39.27	39.97	45.20	37.11
75% percentile	48.33	56.85	51.02	46.59
Mean	38.81	39.47	45.42	38.48
Std. Dev.	12.97	22.48	7.41	14.25
Skewness	-0.04	0.13	0.05	0.68
Kurosis	2.44	1.91	2.59	3.23
< 25 EP	16.18%	32.34%	0.12%	18.31%
	p-Value		p-Value	
KS -Test	0.000		0.000	
MW-U-Test	0.399		0.000	
Median-Test	0.004		0.000	

Source: authors' calculation

For both regions, the KS-Test shows evidence for different distributions for the two cohorts (p-value is zero). The mean and median change over time in Eastern Germany whereas in Western Germany there is no statistically significant variation.[21] The older cohort in Eastern Germany profits from the long, continuous employment in the former German Democratic Republic (GDR) and from the strong revaluation of the incomes of those times. Since the 1970s, workers in Western Germany have faced a growing risk of unemployment, which has led to a lower mean EP level. It is also important to keep in mind that, there are also

[21] A p-value close to zero indicates two different distributions. A p-value of the M-W-U-Test close to zero indicates different distributions with different means and medians. A p-value close to zero of the M-M-test indicates different medians.

individuals in the sample who are now self-employed or civil servants, but who acquired EPs for more than five years.

For the age-group born in 1955 to 1957 in Eastern Germany, the period since the reunification is more important. A lower level of income for unskilled work in connection with increased unemployment leads to a significant increase in the share of people below the critical threshold. In Western Germany (16.2% to 32.3%) as well as in Eastern Germany (0.1% to 18.3%) we observe an increasing risk over time. There is no clear evidence for a change of the median and mean in Western Germany, but the distribution becomes broader. The slight increase in the mean/median EP may be somewhat puzzling with respect to the longer unemployment spells. Two developments may explain our finding. First, over the past three decades, the wage inequality has increased in Western Germany [Dustmann et. al. (2009)]. An increase in the wage inequality translates directly into a broader EP-distribution. Second, the upper limit of EP increased up to 2003 and, since then, has remained almost constant.[22] This made it possible for people with high incomes to get more EP.

In both parts of Germany, the standard deviation increases from the older to the younger cohort. The risk of old-age poverty rises in Eastern and Western Germany. This increase is especially striking in Eastern Germany, but the risk is still below the risk in Western Germany.

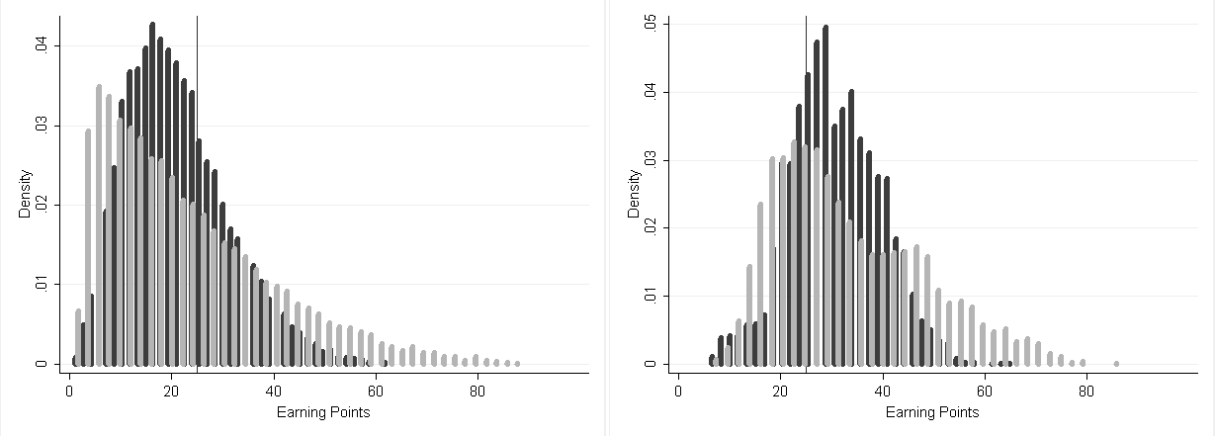
2.4.2 Female pensioners

In Western Germany, the situation of women is quite different from that of men, while in Eastern Germany it is quite similar. Apart from this finding, we detect two specific features

[22] The maximum EP was 1.62 in the 1960s, 1.59 in 1970s, 1.80 in the 1980s and 2.07 in the 1990s. Since 2003, the level has remained nearly constant at 2.14 EP. Deutsche Rentenversicherung (2010) provides an overview of the historical data of the assessment ceiling and the average gross incomes.

for women. First, women collect lower average EPs than men throughout all skill classes, and second, women in Western Germany collect lower average EPs than women in Eastern Germany. Figure 5 displays the EP distributions for females in both parts of Germany.

Figure 5: Earning Point Distribution of Female Pensioners



	Western Germany		Eastern Germany	
	Western 39 -41	Western 55 -57	Eastern 39 -41	Eastern 55 - 57
25% percentile	13.46	9.98	24.46	22.03
50% percentile	19.57	18.99	29.90	30.09
75% percentile	27.02	32.25	36.86	43.50
Mean	20.99	22.94	30.62	33.36
Std. Dev.	10.17	16.30	8.89	14.39
Skewness	0.70	1.03	0.13	0.69
Kurosis	3.29	3.67	2.97	2.76
< 25 EP	69.39%	62.85%	27.32%	34.93%
	p-Value		p-Value	
KS -Test	0.000		0.000	
MW-U-Test	0.016		0.000	
Median-Test	0.000		0.605	

Source: authors' calculation

A comparison of Figure 4 and Figure 5 shows the similarity of the EP distributions of Eastern German men and women as well as the dissimilarity of the EP distributions of Western German men and women. In Eastern Germany, the EP distributions for women and men have similar characteristics with respect to skewness, kurtosis and the standard deviation. The main reason for the different patterns of the EP distributions for women in Eastern and Western Germany and the relative lower EP level in Western Germany is the much lower full-time

labor market participation of women in Western Germany [BMFSFJ (2005)]. Nonetheless the employment rates are nearly equal because of the high part-time employment of women in Western Germany and the poor labor market conditions in Eastern Germany [Grundig (2008)]. As a result, the EP level in Western Germany is more than ten EPs below the Eastern German level (20 EP vs. 30 EP). The distributions in both parts of Germany become broader over time. For Western Germany we found evidence for an increasing full-time labor force participation of the medium- and high-skilled women.[23] Medium- and high-skilled women in Eastern Germany benefit from increasing incomes after reunification. Whereas the low skilled (and part of the medium skilled) women suffer from the poor labor market conditions. The statistical tests show different distribution patterns of old and young women in both parts of Germany. Only the median in Eastern Germany shows no variation.

2.4.3 Relevance of skill

This section explores the impact of education on the expected pension claims of men and women. Our results show that pension levels increase and poverty risk decreases with education. This finding holds true for men and women and also for Eastern and Western Germany. Table 4 reports the summary statistics for the different skill levels with respect to gender and cohort. In Table 4, the higher EP levels of high-skilled men (51.05 EP and 50.03 EP) and women (41.71 EP and 43.68 EP) in Eastern Germany for both cohorts are especially noticeable. For men, the higher share of high-skilled employees with relatively high incomes within the statutory pension system raises the mean EP level and thereby increases the gap between the medium- and high-skilled in comparison to Western Germany. In Eastern Germany, there are more high-skilled people in the statutory pension system because they could not switch into alternate pension systems before 1990 (civil servants or self-

[23] Dustman et. al. (2009) also finds evidence for increased female wage inequality.

employment). Furthermore, the substantially higher mean EP levels of women in Eastern Germany are explained by their higher labor market participation and their higher affinity to full-time employment.

Table 4: Comparison of Mean EP Level by Skill

	Mean EP Male		Mean EP Female	
Skill Level	1939-1941	1955-1957	1939-1941	1955-1957
		Western Germany		
High	42.29	47.48	24.20	27.99
Medium	39.84	38.70	21.98	23.06
Low	32.32	30.44	18.06	17.65
		Eastern Germany		
High	51.05	50.03	41.71	43.68
Medium	44.53	36.93	29.82	31.83
Low	39.11	27.86	23.85	23.86

Source: authors' calculation

The old-age poverty risk decreases with education. This becomes very clear when comparing the situations of low- and high-skilled men.[24] Figure 6 shows the EP distribution of high-skilled men in Eastern and Western Germany whereas Figure 7 shows the EP distribution of low-skilled men in Eastern and Western Germany. The simulation for Eastern Germany demonstrates clearly that old-age poverty risk will increasingly depend on the skill level. Here, the percentage for high-skilled men with 25 or less EPs rises from zero to 10.3%, and the percentage for low-skilled men rises from 3.9% to 53.4%. The 50 percentage point increase is dramatic and may appear unrealistic at first sight. However, the results reflect the poor labor market opportunities for people without vocational training in Eastern Germany. The unemployment rate is above 40% [Reinberg & Hummel (2007)] and the wages of the

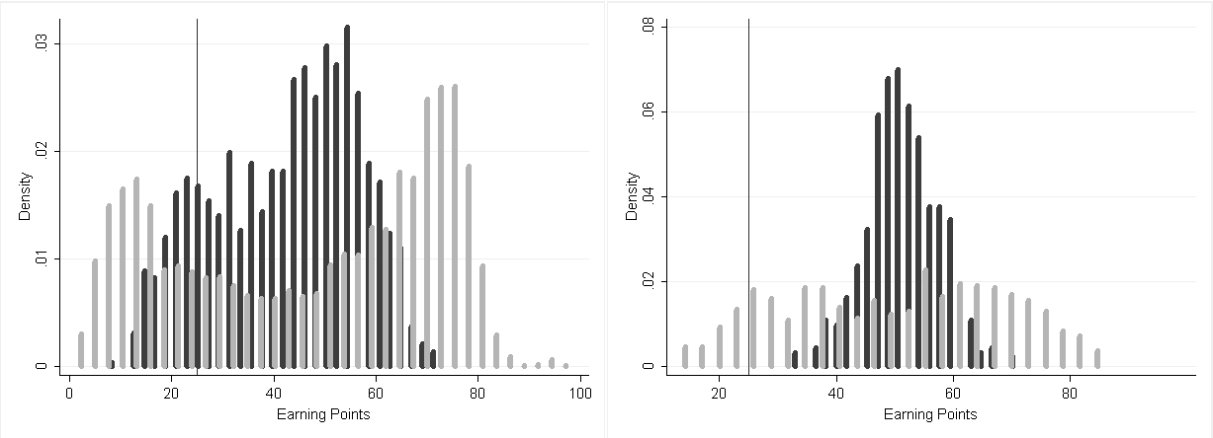
[24] Further details for all skill levels and for both sexes are given in den Appendix.

low-skilled people in employment are low. Fortunately the number of low skilled people in Eastern Germany is relatively low (1.7% in our sample).[25]

Figure 6 shows an old-age poverty risk for the high-skilled men of 10.29% for the young cohort in Eastern Germany. For the old and young cohorts in Western Germany the risk of old-age poverty is 16.09% and 27.96% respectively. For high-skilled men, the old-age poverty risk of the young cohort in Eastern Germany and for both cohorts in Western Germany is overestimated. This overestimation is due to the fact that there are individuals with low EPs within the sample who have left the statutory pension system because they became civil servants or are self-employed. Most of these people are secured by alternate pension schemes. Note that the increasing standard deviation is not an artefact of the bootstrapping method. Using an alternative simulation, we also calculate average values for the simulation period. Thereby we get, especially for the young cohort, nearly the same standard deviations.

[25] In Western Germany, the poverty risk for low-skilled workers is also significantly higher in both cohorts.

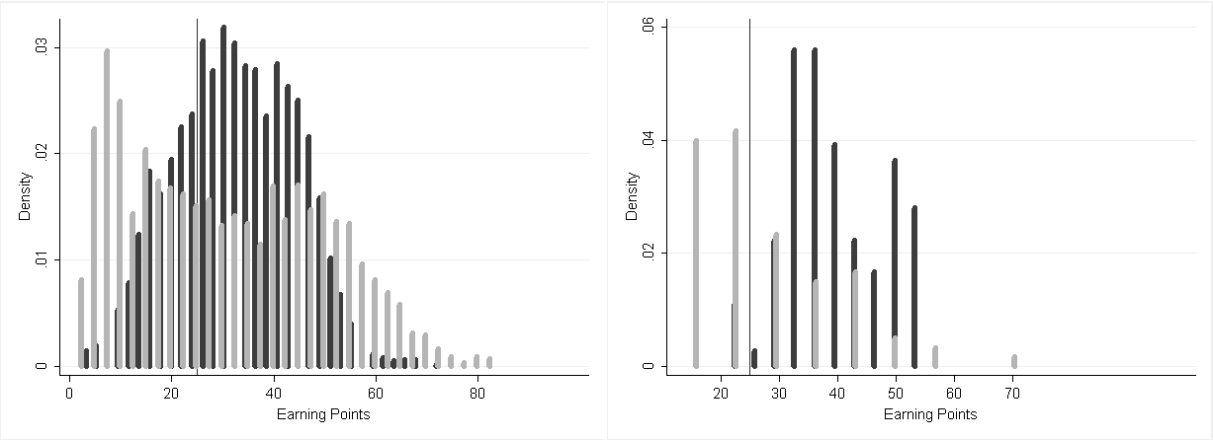
Figure 6: Earning Point Distribution of High Skilled Male Pensioners



	Western Germany		Eastern Germany	
	Western 39 -41	Western 55 -57	Eastern 39 -41	Eastern 55 - 57
25% percentile	31.02	21.84	47.18	34.52
50% percentile	44.71	54.51	51.00	51.59
75% percentile	53.79	70.58	55.24	65.29
Mean	42.29	47.48	51.05	50.03
Std. Dev.	14.13	25.39	6.36	18.36
Skewness	-0.29	-0.32	-0.12	-0.08
Kurosis	2.09	1.61	3.24	1.90
< 25 EP	16.09%	27.96%	0.00%	10.29%
	p-Value		p-Value	
KS -Test	0.000		0.000	
MW-U-Test	0.000		0.967	
Median-Test	0.000		0.499	

Source: authors' calculation

Figure 7: Earning Point Distribution of Low Skilled Male Pensioners



	Western Germany		Eastern Germany	
	Western 39 -41	Western 55 -57	Eastern 39 -41	Eastern 55 - 57
25% percentile	23.78	13.59	32.75	19.02
50% percentile	32.25	28.39	37.37	24.36
75% percentile	41.42	45.86	46.25	36.63
Mean	32.32	30.44	39.11	27.86
Std. Dev.	11.88	18.85	8.44	12.41
Skewness	0.00	0.32	0.13	1.10
Kurosis	2.54	2.03	2.25	4.03
< 25 EP	28.01%	44.71%	3.85%	53.41%
	p-Value		p-Value	
KS -Test	0.000		0.000	
MW-U-Test	0.000		0.000	
Median-Test	0.000		0.000	

Source: authors' calculation

2.5 Sensitivity Analysis

We now discuss the two main critical assumptions of our model and their impact on the estimated risk of old-age poverty. These critical assumption are the Time Factor (TF) equal to one and the constant Earning Point Value (EPV). It is important to note that both of these assumptions do not influence the shape of the calculated EP-distributions but shift the level.

The first critical assumption is a TF equal to one. This assumption does not perfectly reflect the reality but is also not entirely unrealistic. In 2008, the seniority set by law was 65 and the average retirement age in Germany was 63.4 years for men and 63.0 years for women [BMAS

(2009)]. These values are equivalent to a mean TF of 0.95 for men and 0.93 for women. What are the consequences of a TF smaller than one for old-age poverty? It reduces the MP and therefore raises the risk of poverty among the elderly. Including a $TF \neq 1$ into the simulation would be interesting, if we could observe the differences in retirement age according to sex, skill, cohort and residence. In particular, people with low wages should have an incentive for early retirement if their accrued pension rights do not exceed the level of social assistance. Unfortunately, such detailed information about retirement ages is not available from social security statistics.

The second critical assumption is a constant EPV. The following equation shows the calculation of the EPV.

$$EPV_t = EPV_{t-1} * \frac{\omega_{t-1}}{\omega_{t-2}} * \frac{1-\tau_{t-1}-SPP_{t-1}}{1-\tau_{t-2}-SPP_{t-2}} * \left(\left(1-\frac{ODR_{t-1}}{ODR_{t-2}}\right)\alpha + 1\right). \qquad (1.3)$$

The EPV in period t is determined by the EPV in $t-1$ the gross wages, ω, the contribution rates, τ, to the supplementary private savings (Riester pensions), SPP, old-age dependency ratio, ODR, and an exogenous parameter which controls for the impact of variation of the ODR. Higher wages increase the current EPV whereas higher contribution rates, higher supplementary private savings, and a positive ODR growth lowers the current EPV. In the near future, the ODR will begin to rise tremendously and will therefore decrease the EPV.[26] The development of wages is difficult to forecast. To avoid an absolute fall of pensions, a nominal decline of the EPV is excluded by law.[27] However, inflation may cause a real decline of the EPV over time. To depict the influence of a diminishing EPV we calculated a worst

[26] The aging of the German society and the low fertility rates will increase the ODR.

[27] Considering current legislation the EPV-Formula changes actually to:

$$EPV_t = max\left\{EPV_{t-1}, EPV_{t-1} * \frac{\omega_{t-1}}{\omega_{t-2}} * \frac{1-\tau_{t-1}-SPP_{t-1}}{1-\tau_{t-2}-SPP_{t-2}} * \left(\left(1-\frac{ODR_{t-1}}{ODR_{t-2}}\right)\alpha + 1\right)\right\}.$$

case scenario with no EPV- growth. Moreover we assumed an inflation rate of 2% from the year 2009 on. With a constant EPV and 2% inflation each year the critical threshold for an old-age poverty risk is c. p. 30 EP in 2020.[28] Table 5 provides an overview of the increased old-age poverty. In this worst case scenario the higher threshold in 2020 is much more critical for low skilled males in comparison to high- and medium-skilled workers because of their lower EP level. As described above the risk is overestimated for the high skilled and parts of the medium skilled. Furthermore, the overall high old-age poverty risk for women becomes even higher, especially in Western Germany. An important issue while discussing EPV-forecasting is also the discretionary intervention of politics. It is hardly possible to forecast the evolution of the EPV as the legislation is often amended to enable positive EPV growth. Given this uncertainty a status quo projection seems to be the most appropriate approach.

Table 5: Worst Case Scenario Calculation (Cohort 1955-1957)

	Male Pensioners		Female Pensioners	
Skill Level	<25EP	<30EP	<25EP	<30EP
		Western Germany		
High	27.96%	32.00%	51.79%	59.87%
Medium	31.97%	38.43%	62.17%	71.51%
Low	44.71%	52.02%	77.09%	83.31%
All	32.34%	38.47%	62.85%	71.68%
		Eastern Germany		
High	10.29%	18.61%	17.92%	27.66%
Medium	18.82%	31.63%	37.13%	52.89%
Low	53.41%	63.64%	61.03%	77.21%
All	18.31%	30.48%	34.93%	50.49%

Source: authors' calculation

[28] An inflation rate of 2% pushes the means-tested benefits from 583.50 € (Eastern Germany) and 664 € (Western Germany) to 725.51 € and 825.60 €. Using the 2009 EPV this translates into a threshold of 30.07 EP for Eastern Germany and 30.35 EP for Western Germany.

2.6 Conclusion

Is there a growing risk of old-age poverty in Germany? Is old-age poverty more relevant in Eastern Germany? In both parts of Germany, we find a growing risk of old-age poverty and identify education as an important determinant. Especially low-skilled workers face a high risk of old-age poverty. In Eastern Germany, the risk of old-age poverty is growing more rapidly than in Western Germany in every skill group, but for new retirees in the years 2020 - 2022, it is still smaller in magnitude than in Western Germany. Men and women face more or less the same situation. In Eastern Germany, medium- and high-skilled women have benefited from better income opportunities after the reunification.

An analysis based on the statutory pension system clearly has its limits. First, old-age incomes stemming from other sources (e.g., private and occupational pension schemes) are completely ignored. Nevertheless, the statutory pension is and will be the most important pillar of old-age income in Germany. Future research should focus on the second and third pillars of the German pension system.

There is first empirical evidence for the saving behavior of German households from SAVE Dataset of the Mannheim Research Institute for the Economic of Aging (MEA). Coppola (2008) summarizes the initial findings out of this dataset. Coppola (2008) finds a positive correlation of income and savings. She also shows evidence for an increasing number of people with private or occupational pension plans. In 2003, 80% of all respondents had no private pension plan; this number fell to 50% in 2007. This result shows an awareness among the population to diversify their old-age provision but also reinforce our finding of a growing risk of old-age poverty. People with few EP (because of disruptions and gaps in their employment biography and/or because of small incomes) are not likely to overcome their old-age poverty risk via private pension plans.

Second, we do not consider couples. Future research should therefore consider the family situation. First empirical evidence is provided by Deutsche Rentenversicherung (2007) and Krenz et. al. (2009). Both find higher old-age poverty risks for unmarried and divorced men and women whereas couples as well as widows face low old-age poverty risks.

What are the implications of our findings? The growing percentage of people with pension claims below the level of social assistance creates a challenge for policies. To overcome this problem the literature proposes mandatory private savings with tax-financed support of low income earners and of long-term unemployed [Bonin (2009)]. Such a reform may lower the tax burden in the future when more people can rely on their savings. The support for current low-income household, however, requires additional tax revenues today.

Another opportunity to attenuate old-age poverty is proposed by Breyer & Hupfeld (2009). They propose a new benefit formula which takes individual life-expectancy into account. The new formula models the idea of distributive neutrality which leads to higher benefits for people with a lower life expectancy. The new benefit formula leads to a concave relationship between the annual earnings and the annual retirement benefits. By using data from the Federation of German Pension Insurance Institutes they show that their new formula reduces the old-age poverty risk among long-term contributors to the system.

Our research findings imply a significant increase of old-age poverty risk in Germany. An increasing number of pensions will have to be supplemented by social assistance because the individual pension claims are too low. Applying for supplementary social assistance creates a social stigmatization which is often criticized in German politics. The municipalities provide the supplementary social assistance and are compensated for this from the federal budget. To overcome social stigmatization the statutory pension insurance could simply pay all old-age incomes. The implicit minimum pension would be converted into an explicit minimum pension. As this is a pure transfer of resources between government institutions, the reform

would be fiscally neutral. In contrast to reform measures that imply a stronger move towards a Beveridge system, the proposed small reform option does not further distort the labor supply.

Another policy options is the introduction of a minimum pension that is paid without means-testing. Even if this minimum pension is set at the level of current social assistance (means-tested), it will create additional fiscal burdens as take-up rates will increase.

2.7 References

Berlemann, M. and Thum, M. (2005), Blooming Landscapes in Eastern Germany?, *Cesifo Forum* 4/05.

Bundesministerium für Arbeit und Soziales (BMAS) (2008), Alterssicherungsbericht 2008, Berlin.

Bundesministerium für Arbeit und Soziales (BMAS) (2009), Rentenversicherungsbericht 2009, Berlin.

Bundesministerium für Familie, Senioren, Frauen und Jugend (BMFSFJ) (2005), 1. Datenreport zur Gleichstellung von Frauen und Männern in der Bundesrepublik Deutschland, Berlin.

Börsch-Supan, A., Bucher-Koenen,T., Reil-Held, A. and Wilke,C. (2008), Zum künftigen Stellenwert der ersten Säule im Gesamtsystem der Alterssicherung, *MEA Discussion Paper* No. 08158, Mannheim Research Institute for the Economics of Aging, University of Mannheim.

Bonin, H. (2009), 15 Years of Pension Reform in Germany: Old Successes and New Threats, *The Geneva Papers* 34, 548-560.

Breyer, F. and Hupfeld, S. (2009), Fairness of Public Pensions and Old-Age Poverty, *FinanzArchiv* 65, 358-380.

Breyer, F. and Buchholz,W. (2009), Ökonomie des Sozialstaats, Springer,Berlin.

Coppola, M. (2008), Das Sparverhalten der deutschen Haushalte, *MEA Policy Brief* 5/2008, Mannheim Research Institute for the Economics of Aging, University of Mannheim.

Deutsche Rentenversicherung (2007), AVID - Altersvorsorge in Deutschland 2005, Forschungsprojekt im Auftrag der Deutschen Rentenversicherung und des Bundesministeriums für Arbeit und Soziales, Berlin.

Deutsche Rentenversicherung (2008), Codeplan FDZ-Biografiedatensatz VSKT 2005, Deutsche Rentenversicherung Forschungsdatenzentrum, Berlin.

Deutsche Rentenversicherung (2010), http://forschung.deutsche-rentenversicherung.de/ForschPortalWeb/view3sp.jsp?viewName=statzr_Kenngr\\%F6%DFe %20und%20Bemessungswerte&viewCaption=Statistiken%20-%20Kenngr%F6%DFen%20und%20Bemessungswerte%20-%20Zeitreihen&chmenu=ispvwNavEntriesByHierarchy65, retrieved 12.02.2010, 11:58 h.

Drews, N. (2008), Das Regionalfile der IAB-Beschäftigtenstichprobe 1975- 2004, *FDZ Methodenreport* No. 02/2008, Institute for Employment Research, Nuremberg.

Dustmann, C., Ludsteck, J. and Schönberg, U. (2009), Revisiting the German Wage Structure, *Quarterly Journal of Economics* 124, 843-881.

Federal Statistical Office Germany (2009), Bevölkerung Deutschlands bis 2060 - Ergebnisse der 12. koordinierte Bevölkerungsvorausberechnung, Wiesbaden.

Federal Statistical Office Germany (2010), Sozialleistungen - Fachserie 13 Reihe 2.2, Wiesbaden.

Grundig, B. (2008), Why is the share of women willing to work in Eastern Germany larger than in Western Germany? A logit model of extensive labour supply decision, *Ifo Working Paper* 56, ifo Institute for Economics Research at the University of Munich, University of Munich.

IABS-R04, IAB-Beschäftigtenstichprobe: Scientific Use File Regionalfile 1975 - 2004, Nuremberg.

Krenz, S., Nagl, W. and Ragnitz, J., Is There a Growing Risk of Old-Age Poverty in Eastern Germany?, *Applied Economics Quarterly Supplement* 55 (60), 35-54.

Massey, F. J. (1951), The Kolmogorov-Smirnov Test for Goodness of Fit, *Journal of the American Statistical Association* 253, 68-78.

OECD (2009), Pensions at a Glance 2009 - Retirement-Income Systems in OECD Countries, OECD Publishing, Paris.

Reinberg, A. and Hummel, M. (2007), Qualifikationsspezifische Arbeitslosigkeit im Jahr 2005 und die Einführung der Hartz-IV-Reform – Empirische Befunde und methodische Probleme, *IAB Forschungsbericht* 9/2007, Institute for Employment Research, Nuremberg.

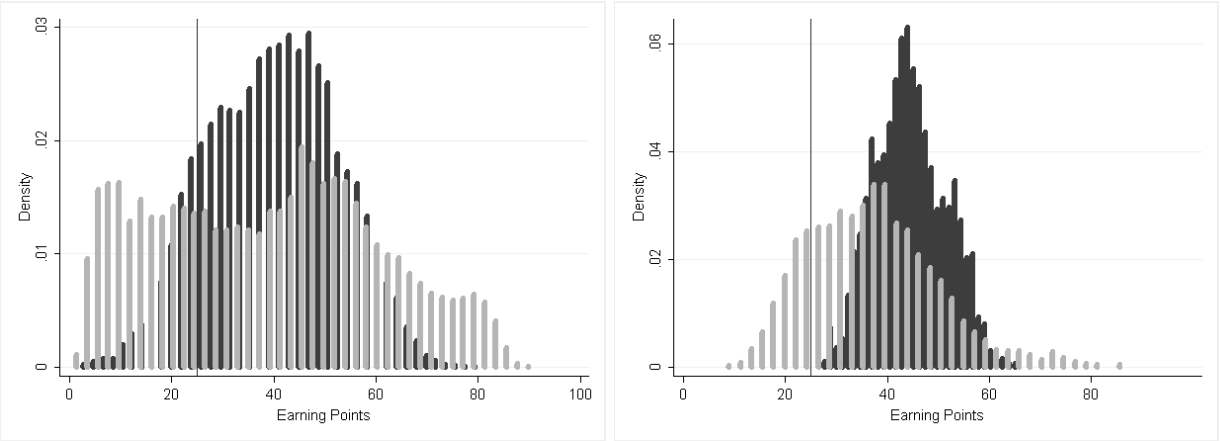
Stegmann, M. (2009), Benutzerhinweise - Methodische Umsetzung FDZBiografiedatensatz VSKT, Deutsche Rentenversicherung Forschungsdatenzentrum, Berlin.

Siegel, S. (1957), Nonparametric Statistics, *The American Statistician* 11 (3), 13-19.

VSKT (2005), SUF FDZ-Biografiedatensatz - VSKT2005 Quelle: FDZ-RV, Berlin.

2.8 Appendix

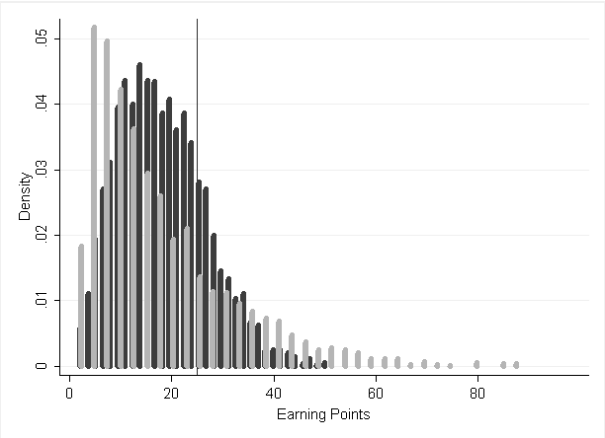
Figure 8: Earning Point Distribution of Medium Skilled Male Pensioners

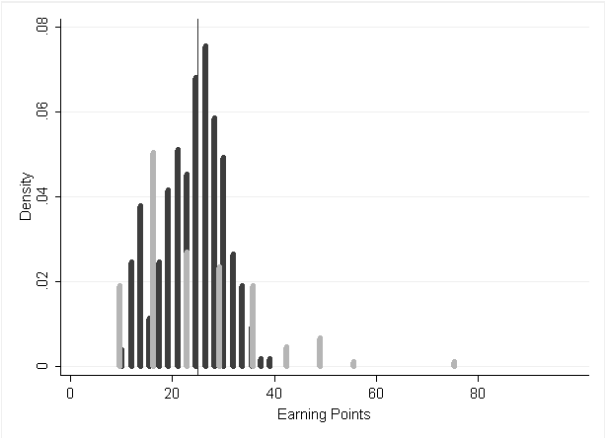


	Western Germany		Eastern Germany	
	Western 39 -41	Western 55 -57	Eastern 39 -41	Eastern 55 - 57
25% percentile	30.28	20.02	39.59	27.43
50% percentile	40.27	39.38	44.12	36.28
75% percentile	49.07	54.65	49.42	44.63
Mean	39.84	38.70	44.53	36.93
Std. Dev.	12.63	21.63	6.95	12.58
Skewness	-0.06	0.15	0.14	0.60
Kurosis	2.47	2.04	2.49	3.41
< 25 EP	13.68%	31.97%	0.00%	18.82%
	p-Value		p-Value	
KS -Test	0.000		0.000	
MW-U-Test	0.000		0.000	
Median-Test	0.002		0.000	

Source: authors' calculation

Figure 9: Earning Point Distribution of Low Skilled Female Pensioners

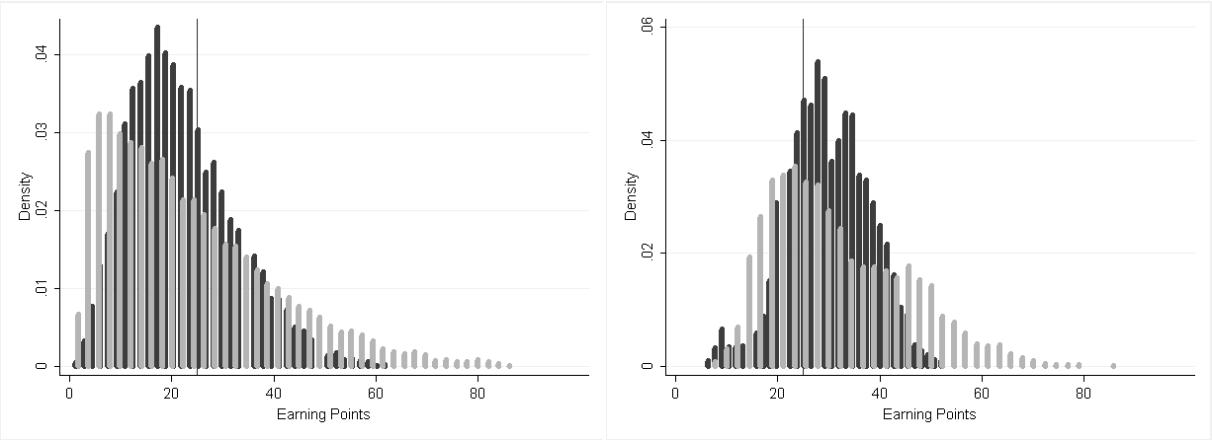




	Western Germany		Eastern Germany	
	Western 39 -41	Western 55 -57	Eastern 39 -41	Eastern 55 - 57
25% percentile	11.41	7.48	19.80	15.35
50% percentile	17.14	13.51	24.59	20.68
75% percentile	23.56	23.54	28.06	28.81
Mean	18.06	17.65	23.85	23.86
Std. Dev.	8.62	13.69	6.09	11.47
Skewness	0.55	1.51	-0.26	1.40
Kurosis	3.08	5.63	2.49	6.05
< 25 EP	79.20%	77.09%	53.61%	61.03%
	p-Value		p-Value	
KS -Test	0.000		0.000	
MW-U-Test	0.000		0.054	
Median-Test	0.000		0.024	

Source: authors' calculation

Figure 10: Earning Point Distribution of Medium Skilled Female Pensioners

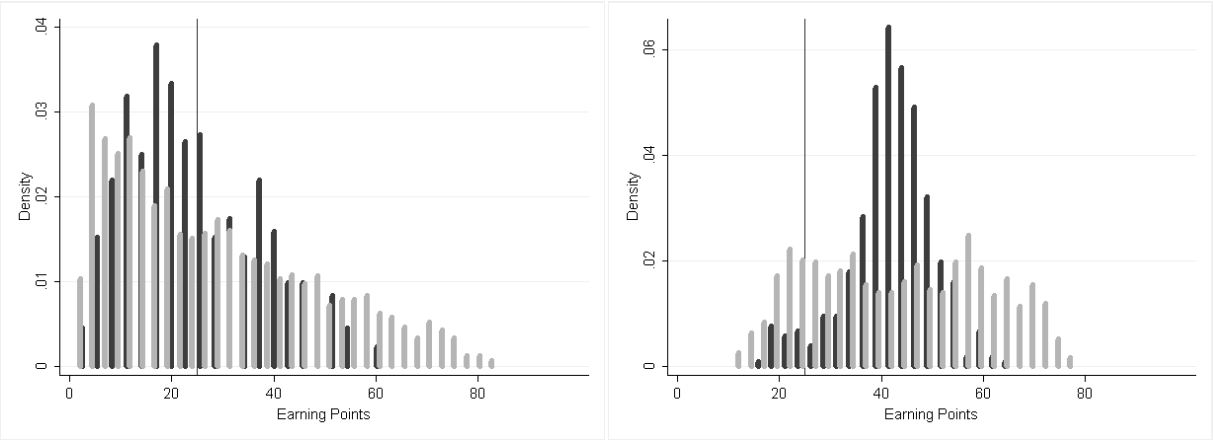


Western Germany | Eastern Germany

	Western 39 -41	Western 55 -57	Eastern 39 -41	Eastern 55 - 57
25% percentile	14.35	10.38	24.33	21.6
50% percentile	20.47	19.53	29.45	29.05
75% percentile	28.4	32.29	35.46	41.16
Mean	21.98	23.06	29.82	31.83
Std. Dev.	10.34	15.91	7.99	13.08
Skewness	0.66	0.99	-0.09	0.68
Kurosis	3.15	3.67	2.92	2.86
< 25 EP	66.04%	62.17%	27.77%	37.13%
	p-Value		p-Value	
KS -Test	0.000		0.000	
MW-U-Test	0.000		0.192	
Median-Test	0.000		0.183	

Source: authors' calculation

Figure 11: Earning Point Distribution of High Skilled Female Pensioners



	Western Germany		Eastern Germany	
	Western 39 -41	Western 55 -57	Eastern 39 -41	Eastern 55 - 57
25% percentile	13.62	11.31	38.11	28.49
50% percentile	21.77	23.76	42.32	43.64
75% percentile	33.72	41.52	46.62	57.72
Mean	24.20	27.99	41.71	43.68
Std. Dev.	12.95	19.65	8.29	16.95
Skewness	0.57	0.069	-0.62	0.05
Kurosis	2.56	2.51	4.05	1.83
< 25 EP	59.39%	51.79%	5.30%	17.92%
	p-Value		p-Value	
KS -Test	0.000		0.000	
MW-U-Test	0.096		0.075	
Median-Test	0.043		0.105	

Source: authors' calculation

3 Is There a Growing Risk of Old-age Poverty in Eastern Germany?[1]

by Stefan Arent, Wolfgang Nagl and Joachim Ragnitz

3.1 Introduction

Every now and then there is a public and political debate about the growing old-age poverty risk in Eastern Germany. Besides other arguments, there are two points one has to consider seriously: demographic change and the difficult labor market situation in Eastern Germany after reunification. With regard to demographic change, the main point is the increasing proportion of retired people in relation to the labor force. Over time this will lead to decreasing benefits in terms of statutory pension insurance. A more relevant problem concerning old-age poverty is unemployment in Eastern Germany. Many people have disruptions and gaps in their employment biography. For the old-age income situation this is negative in two ways. First of all, people do not acquire as much entitlement to the statutory pension as they would if they were working. This is especially a problem for long-term unemployed people. After the labor market legislation reforms of 2003 and 2004, this group earns nearly no pension claims during long-term unemployment periods. Secondly, people are not able to make sufficient private or occupational provision while unemployed.

So is there a growing risk of old-age poverty for German households? To our knowledge, there is only one study which analyzes this question by focusing on marital status [Deutsche Rentenversicherung Bund, 2007)]. This study finds that an increasing proportion of households have a “low” overall old-age income (statutory pension, private and occupational pension) by comparing the cohorts 1942 to 1946 with the cohorts 1957 to 1961. Unfortunately the authors did not calculate the proportion of households with a risk of old-age poverty (i.e. a

[1] This chapter is published as "Is There a Growing Risk of Old-Age Poverty in EasternGermany?" in Applied Economics Quarterly Supplement 55 (60), 2009, 35-54.

retirement income below the level of Social Assistance). Also, the sample size does not allow for a detailed distribution of old-age income to be described, so the authors have to define specific income groups.[2] In contrast to this study, we can answer this question by focusing on German statutory pension insurance and on the marital status of the households. We do this for two reasons. Firstly, there are no reliable data concerning occupational pension schemes and private retirement arrangements which would allow us to create detailed income distributions. Second, the benefits from the statutory pension insurance are, and will be in the future, the most important income source for pensioners. Today the share of income from the statutory pension insurance to the whole old-age income is about 90% and will only slightly decrease to 85% in 2020.[3] Taking this fact into account, focusing on the statutory pension can help create a good approximation of the old-age income and therefore of old-age poverty risk (civil servants and self-employed may have additional/alternative pension schemes). In order to detect changes in old-age poverty risk over time we focus on new pensioners in the years 2004 – 2006 and compare them with new pensioners in 2020 – 2022. We analyze the impact of marital status because the majority of the elderly have partners and marital status is particularly important for the old age income of the household [Deutsche Rentenversicherung Bund (2007)]. Although we are mainly interested in the situation in Eastern Germany, in addition we will calculate the situation for Western Germany, in order to find similarities as well as differences.

Our analysis starts with a short description of the German Pension System (3.2). Section 3.3 summarizes demographic facts for Eastern Germany. The proportion of people who live in a relationship increases with age. It is important for our analysis that widows are the second largest group of female retirees. In section 3.4 we present our methodology and data. We

[2] Studies later on calculate at least the old-age poverty risk [see Gühne et al. (2012)].

[3] See Deutsche Rentenversicherung Bund (2007).

construct a micro-simulation-model and use data from the Institute for Employment Research (IAB) and the German Federal Pension Fund. Subsequently, we present a comparison of the situation of new pensioners in 2004 – 2004 and 2020 – 2022. We start with our calculation for single households in section 3.5. While the old-age poverty risk for single females does not change, we find a growing risk for single males. The results for couples in section 3.6 confirm the trend towards a more tense income situation for elderly people in 2020. In section 3.7 we show that widows are the best protected group with respect to the statutory pension system. Section 3.8 concludes.

3.2 The German Pension System

The German Pension System is based on three pillars. The first and most important is the statutory pension system. In 2004 over 90% of the old-age income of new retirees in Eastern Germany was based on the statutory pension. This number will decrease slightly to 85% by 2020. The second pillar consists of occupational pension schemes. This pillar will become more important over time. Its average share of the total old-age income in Eastern Germany will increase from 5% (2004) to 10% (2020). The third pillar consists of private retirement arrangements. The share of these will also rise from 2% (2004) to 5% (2020).[4] We focus our analysis on the statutory pension scheme in Germany in order to judge the risk of old-age poverty. The number of private and occupational pension schemes illustrates that this approach is well justified.

The German statutory pension system is a pay-as–you-go-pension system. The monthly pension (MP) of a retired person is determined by four factors as given in the following equation:

[4] See Deutsche Rentenversicherung Bund (2007).

$$MP = TF * PF * EPV * EP. \quad (2.1)$$

The Time Factor (TF) depends on retirement age. At the regular retirement age (we assume 65 years) it is equal to one. With respect to old-age pensions, the Pension Factor (PF) is also equal to one. It deviates for other pension types (e.g. surviving dependant's or disability pension). The Earning Point Value (EPV) translates the Earning Points (EP) into an amount of money. It is determined by three factors: a demographic factor, the growth rate of wages, and a factor which takes into account the growth of the contribution rate to the statutory pension insurance. The EPV is calculated separately for each year in Eastern and Western Germany. For our analysis we keep the EPV constant. In the following analysis we focus on the EP distribution. The EP is calculated as a ratio of the individual income and the average income in Western Germany.[5] Because of the lower wage level in Eastern Germany, the individual income is increased by a multiplier[6] which takes the different wage levels in both parts of Germany into account. Labor income is subject to social insurance contributions up to the social security contribution ceiling.[7] Besides socially secured employment, an individual also acquires EP during unemployment. When receiving unemployment benefits (*Arbeitslosengeld I)* an amount of 80% of the previous income is taken into consideration in order to calculate the EP. During long term unemployment (*Arbeitslosengeld II*) the calculation base is 205 € per month. This is equivalent to about 0.1 EP per year.

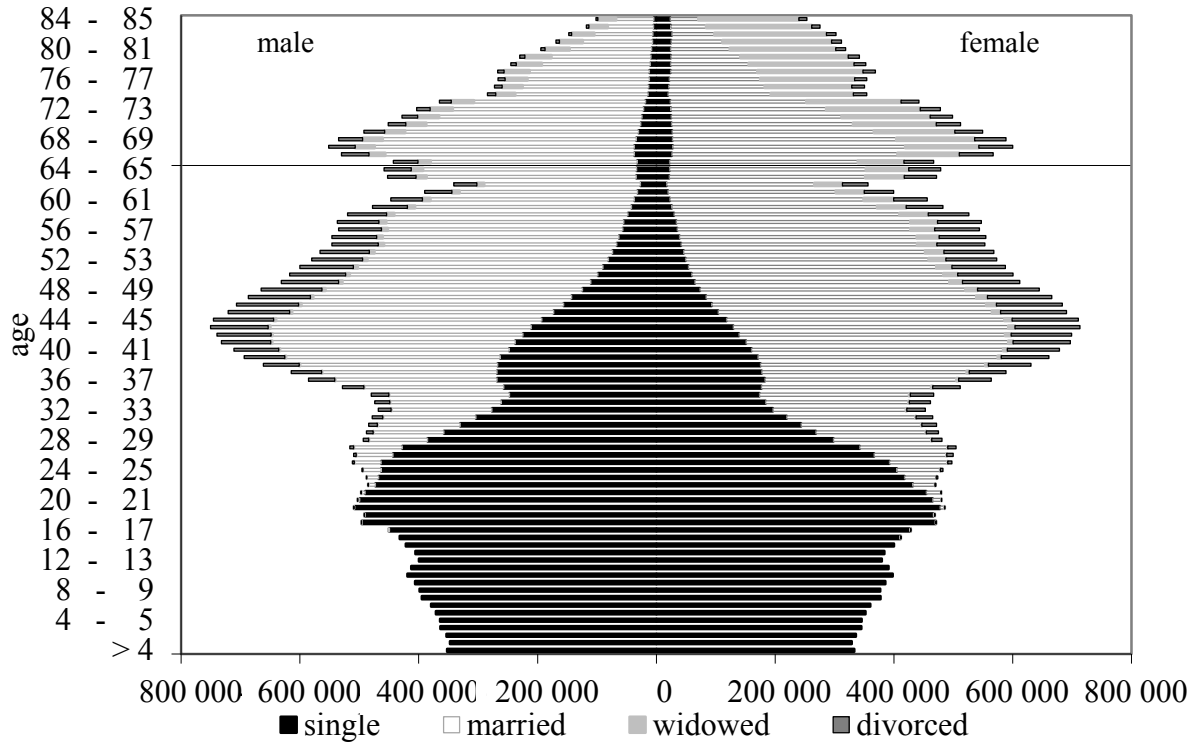
[6] In 2008 the raising factor was 1.1827.

[7] 54.600 € (East) and 64.800 € (West) in 2009.

3.3 Demographic Setting in Eastern Germany

The risk of old-age poverty depends largely on marital status. Hereby it is most important whether an individual lives alone or is also supported by a partner. So what are the facts for Eastern Germany? The current age pyramid for Eastern Germany in Figure 12 shows that the higher the age the lower the share of non-widowed singles. For people over 65, the proportion of singles is about 2% for men and 8% for women. In this age-group, 85% of the men and 47% of the women are married. The lower percentage of married women is due to the fact that there are a large number of female widows. 45% of all women over 65-year-old are widowed, in comparison with only 13% of men. In what follows, these shares are assumed for both cohorts.[8]

Figure 12: Family Situation of Households in Eastern Germany



Source: Federal Statistical Office Germany (2008), authors' calculations.

We define a person or couple as poor if their entitlements do not exceed the social assistance which is guaranteed by the German welfare system. For people who live alone, we assume 30

[8] BMFSFJ (2000) shows evidence for a high and constant share of partnerships of elderly people.

EP as the critical threshold. 30 EP are currently equivalent to 700.20 € in Eastern Germany and 796.80 € in Western Germany. For couples, we set 48 EP as the critical threshold. This is currently equivalent to 1120.32 € in Eastern Germany and 1274.88 € in Western Germany.[9]

3.4 Data and Methodology

In contrast to the related literature, we derive Pension Point distributions for elderly single households, couples and widows with respect to education. To identify changes in the risk of old-age poverty, we focus on the number of EPs of new pensioners in the period 2004 to 2006 compared to the EPs of people who retired between 2020 and 2022. Hereby we distinguish between three skill levels. An individual is considered as low-skilled if he/she is lacking vocational training. A medium-skill level is reached when vocational training was completed successfully. Individuals with an academic degree are defined as being highly qualified. We also calculate separate distributions for men and women. We assume for all individuals a retirement age of 65, so the "old" cohort of new pensioners was born between 1939 and 1941. The "young" cohort consists of people who were born between 1955 and 1957. Methodologically our work is based on the analysis of elderly single households in Arent & Nagl (2010).[10]

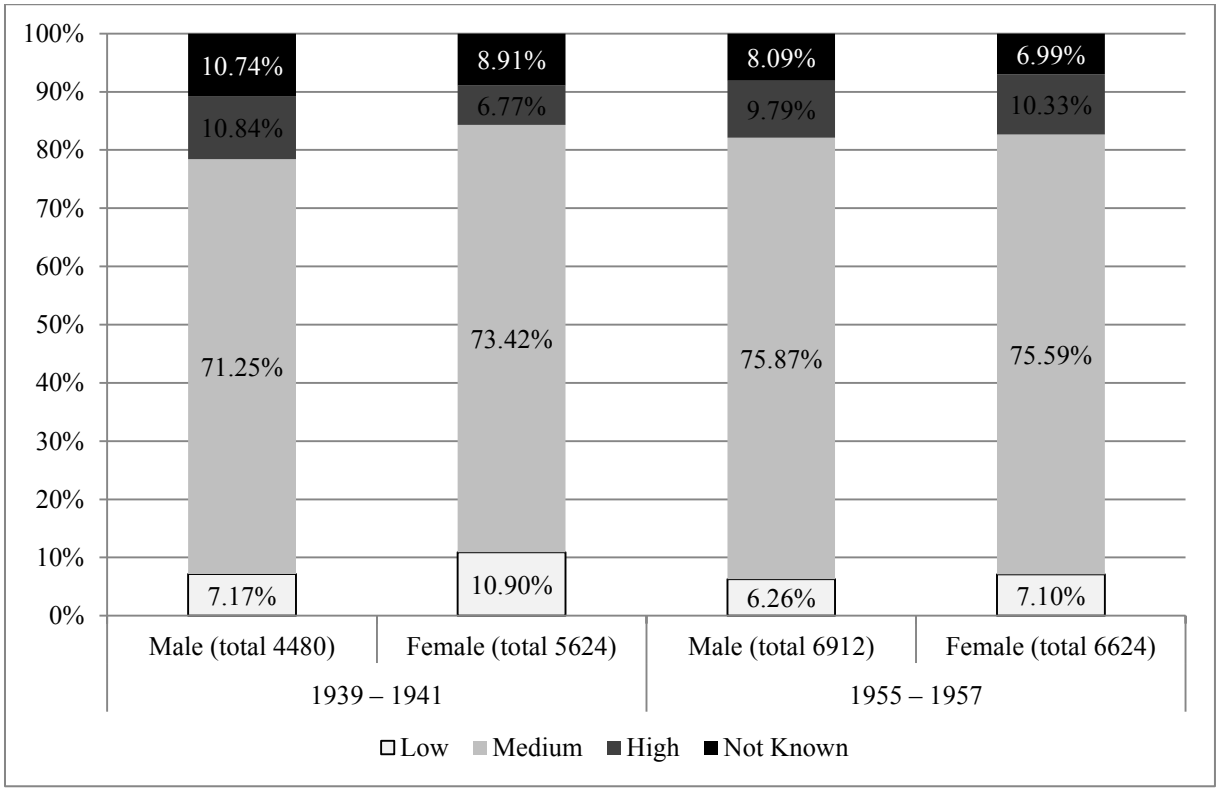
The most important dataset in our analysis is the *IAB-Beschäftigtenstichprobe: Scientific Use File Regionalfile 1975 – 2004 (IABS-R04)* from the German Institute for the Labor Market and Job Research (IAB). This dataset is a two percent sample of all German workers within the social security system. We chose this dataset mainly because of its size. There are datasets from the Research Center of the German Pension Fund which might fit better due the

[9] In later analysis we reduce the critical threshold to 25 EP because of the increasing Earning Point Value (EPV) and comments by the referees [Arent and Nagl (2010)].

[10] Arent and Nagl (2010) describe the methodology for calculating the EP in detail. Furthermore a description of the datasets is given.

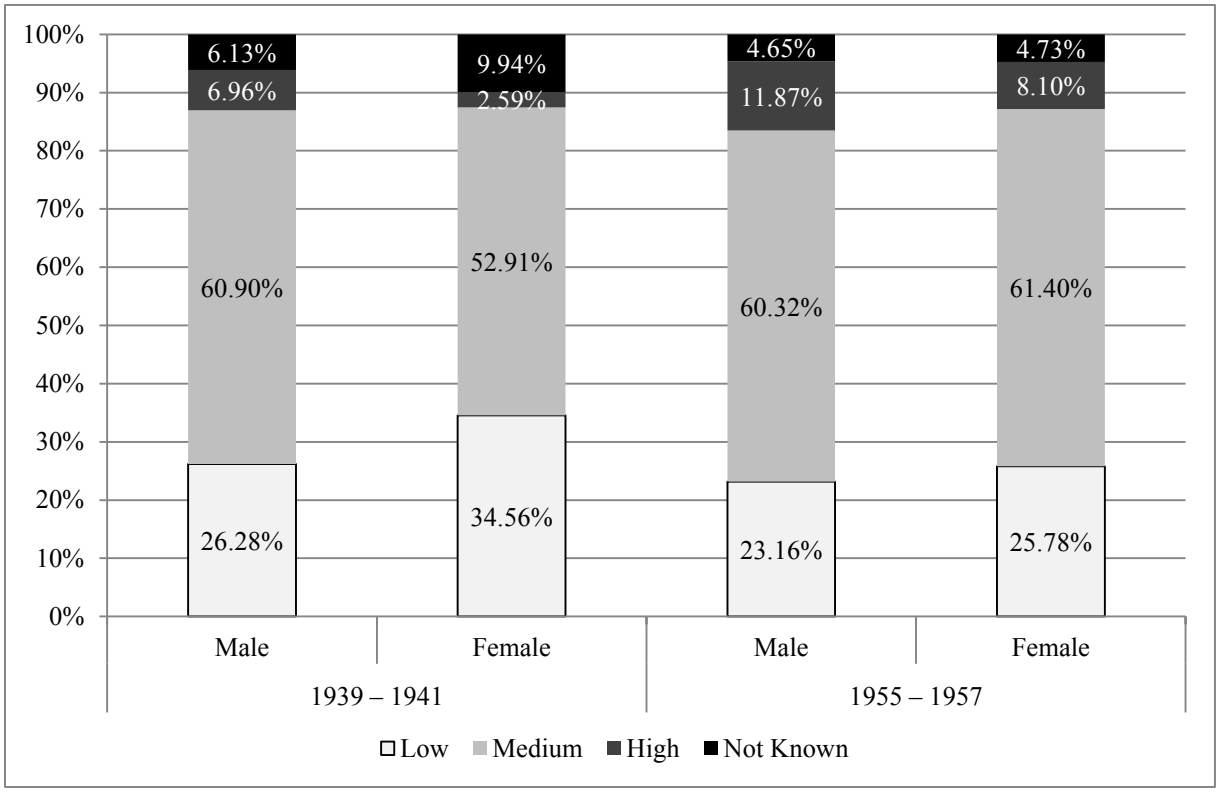
information they hold, but they are nearly twenty times smaller than the IABS-R04. When we analyze different skill levels the size of the dataset becomes very important. Especially for the persons without vocational training the sample of the Research Center of the German Pension Fund is too small. The IABS-R04 provides information on a daily basis from 1975 till 2004 for Western Germany and from 1992 to 2004 for Eastern Germany. The IABS-R04 allows for deriving EP distributions according to age, gender, place of residence and skill. For each person in the sample, the daily income is known, as well as the exact periods of unemployment. The composition of the samples with respect to skills, gender and age in the IABS-R04 is given in Figure 13 and Figure 14.

Figure 13: Distribution of Skill-levels in Eastern Germany



Source: authors' calculations.

Figure 14: Distribution of Skill-levels in Western Germany



Source: authors' calculations.

In order to assess the whole employment biography, we added information from the *SUF FDZ-Biografiedatensatz – VSKT 2005 Quelle: FDZ-RV (VSKT 2005)* to the IABS-R04 that we obtained from the Research Data Centre of the German Federal Pension Fund. The VSKT 2005 contains information about the monthly EP according to age, gender, place of residence and skill. We combined the IABS-R04 with the much smaller VSKT 2005, using a bootstrap method [see Arent and Nagl (2010)].

To derive a picture for new pensioners in 2020 to 2022 we can make projections for individual employment patterns. We can do this by extrapolating the employment patterns given in the IABS-R04. We can assume that the individual probability of employment, unemployment and long term unemployment will not change until 2020-2022.

3.5 Single-person Households

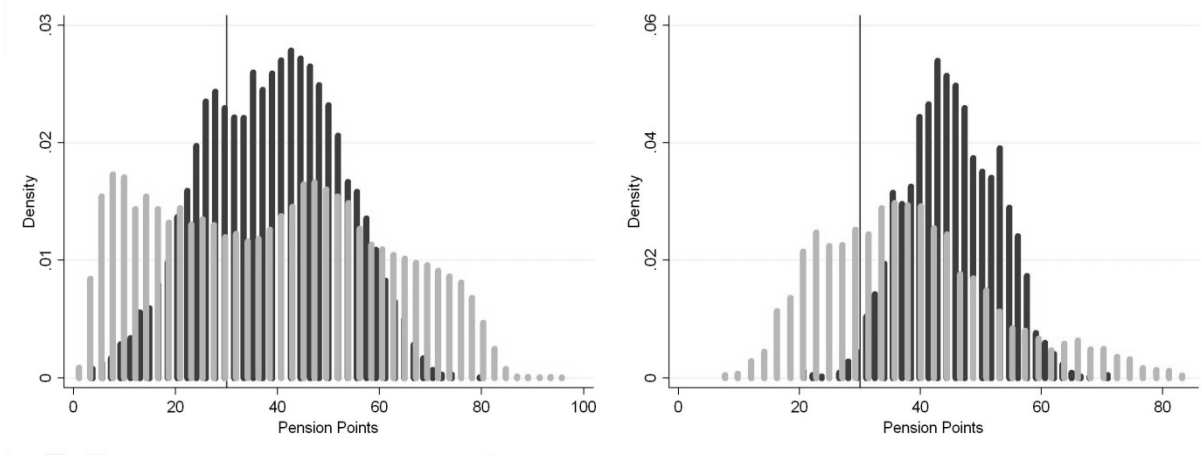
Non-widowed single-person households are the group with the highest risk of old-age poverty. As mentioned above, this group is not that large, but it is a significant part of society. Because of the lack of specific data, we use the EP distribution of the whole dataset for single-person households. For male pensioners this appears to be an appropriate approach because a full-time working career for men is usually considered independently of marital status. For females this is only the case in Eastern Germany. In Western Germany the calculated EP of females are strongly affected by the marital status because of the lower labor participation of married females. Therefore the results of female single-person households should be interpreted with caution.

3.5.1 Males

Figure 15 shows the EP distribution of all men in Eastern and Western Germany. The dark color represents the cohort of 1939 to 1941, the bright color the cohort of 1955 to 1957. Indeed, the mean EP level is almost constant but we observe an increasing old-age poverty risk in both parts of Germany. For single males the risk of old-age poverty rises tremendously in Eastern Germany: whereas in the “old” cohort, only 1.34% of men acquired less than 30 EP. In the “young” cohort this number increases to 31.60%.

Figure 15: Earning-Point-Distribution of Male Pensioners

Western Germany **Eastern Germany**



	Western Germany		Eastern Germany	
Skill Level	1939-41	1955-57	1939 - 41	1955-57
Medium	21.98%	36.32%	0.93%	31.27%
High	22.62%	30.96%	none	17.52%
Low	45.57%	54.69%	8.19%	67.25%
All	28.26%	39.17%	1.34%	31.60%.

Source: authors' calculations.[11]

The special contribution of our analysis is the skill-specific and marital status approach. Figure 15 describes the share of persons below the critical value of 30 EP with respect to all pensioners of the same skill level. The medium level forms the majority and will be the first to be analyzed in what follows. Over time we observe an increasing portion of pensioners below the critical threshold. Part of this group probably has no or little private or occupational pensions because of their weak income situation. However, some pensioners in this group might be protected by other pension schemes due to their career type (e.g. civil servant or self-employed). These are people who are insured by the statutory pension insurance for more

[11] Here we use 30 EP as critical level. In chapter 2 the critical threshold was set to 25 [Arent and Nagl (2010)].

than five years but may be came civil servant or self-employment later in their career. The Deutsche Rentenversicherung Bund (2007) claims that the high percentage of people below 30 EP is a consequence of this. In general, we can state that most of the medium skilled single males in both parts of Germany will get a statutory pension at a sufficient level. In Eastern Germany the statutory pension provides the major element of the whole old-age income, while especially in Western Germany private and occupational pensions back up the statutory pension [see Deutsche Rentenversicherung Bund (2007)].

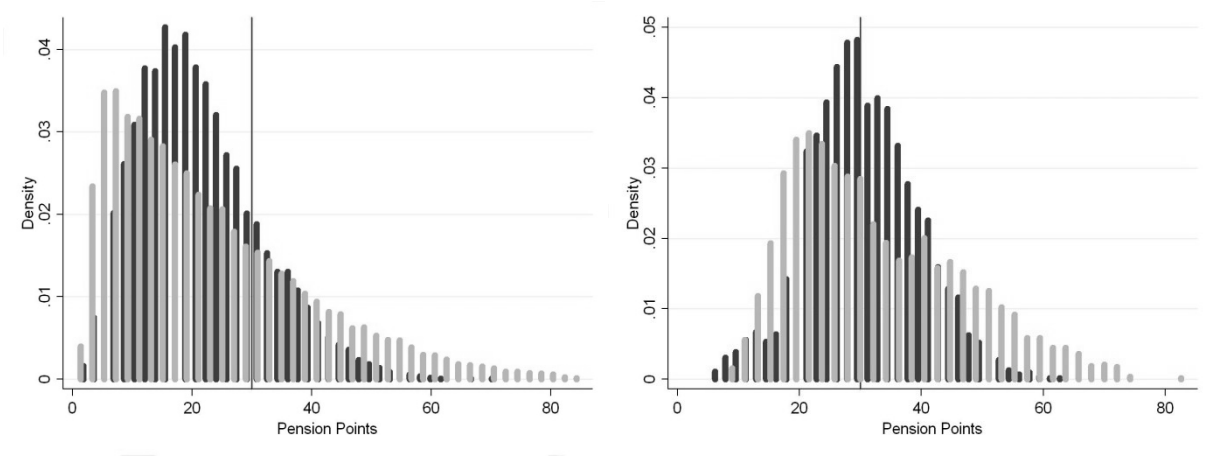
Employees with a graduate degree are a case apart, because of two facts. This group contains a great number of people working outside the statutory pension system (civil servants as well as the self-employed) receiving only few pension points. Highly skilled employees inside the social security system normally reach a high average level of statutory pension in both regions and for all cohorts and will not face the risk of old-age poverty. The scenario for employees without vocational education is the most critical. Our forecast for this group shows a high percentage of people near or below the critical EP value. Except for the "old" cohort in Eastern Germany, at least 45% have less than 30 EP. Comparing the cohorts, we find that the huge unemployment and the low income reduces the accrued EP of the "younger" cohort dramatically. In the times of the former GDR, this group earned comparable wages to medium-skilled workers. Due to the structural change after German unification, the labor market chances of low-skilled workers worsened. However, in Western Germany more then 54% of the "young" cohort face a high old-age poverty risk. Many employees of this education level are often not able to acquire private or occupational pensions, so a high share of this group will need basic public financial security in old-age (*Grundsicherung im Alter*).

3.5.2 Females

The situation of the females is quite different to that of the males. On average, the percentage of women with less than 30 EP is constant at about 51% in Eastern Germany.

Figure 16: Earning-Point-Distribution of Female Pensioners

Western Germany **Eastern Germany**



	Western Germany		Eastern Germany	
Skill Level	1939-41	1955-57	1939-41	1955 - 57
Medium	77.31%	70.22%	51.41%	52.25%
High	68.54%	58.34%	7.67%	22.80%
Low	89.80%	84.68%	84.68%	81.35%
All	81.66%	72.64%	51.39%	51.36%

Source: authors' calculations.

The distribution of EP is described in Figure 16 for all women in Eastern and Western Germany. The females show a typical right-skewed distribution except for the "old" cohort in Eastern Germany. Again, the mean EP level is relatively constant, but in both parts of Germany we can observe a high old-age poverty risk for all cohorts. In general, the percentages beneath the critical threshold are lower for Eastern German women.

Medium-skilled women are better protected in Eastern Germany. The reason for this can be found in the employment situation in the former GDR. Females often worked full-time in contrast to females in Western Germany, where many women were employed only part-time [Deutsche Rentenversicherung Bund (2007)]. In the absence of other protection (e.g. via family) more than 70% of both cohorts in Western Germany will need social transfers to reach the level of social assistance. The reason is the traditional choice to be employed part-time or to be a housewife. In Western Germany the "young" cohort of medium-skilled women shows a stronger tendency to full-time employment, so some women generate higher levels of EP, which leads to a decreasing risk of poverty. There is a different situation in Eastern Germany. The higher labor participation of females here leads to a lower percentage of women who face the risk of old-age poverty.

Quite a different picture arises for highly qualified females. Here we find strong differences in both cohorts in Eastern and Western Germany. While single women with an academic degree in Eastern Germany reach approximately the mean EP level of medium-skilled men, about 60 to 70% of women in Western Germany will get an EP level below the critical threshold. Therefore, the increase in the number of women who choose full-time employment in Western Germany plays an important role in the decrease of the risk of old-age poverty (minus 10%). For Eastern Germany the risk of old-age poverty is much smaller than in Western Germany (only 23% of the "young" cohort is affected). Nevertheless, we can observe an increase in the percentage in Eastern Germany. The reason is the same as for highly skilled men (civil service, self-employment). In addition, part-time employment and being a housewife also plays a role.

As with low-skilled males, the highest risk of old-age poverty is found in low-skilled females. Over time we can observe a constant high ratio of females facing old-age poverty risk. Thereby the high risk for the "old" cohort in Eastern Germany is surprising, because men of

the same skill level and cohort are protected, like medium-skilled. The rate in both parts of Germany is always over 80%. Most of the low-skilled single females do not participate in private or occupational pension schemes and so they need access to additional social transfers.

3.6 Two-Person-Households

The old-age risk of couples is the most important issue to be analyzed because the majority of all pensioners live in a marriage [see Figure 12]. One of our main results is that most couples in Eastern Germany do not face a great old-age poverty risk, although the situation will be more difficult by 2020. Methodically we base our two-person household analysis on the results of Federal Statistical Office Germany (2008) and the former individual information. This analysis uses the *Mikrozensus* 2005 to access information about the marital status of German households and shown that the majority of relationships exist between partners with similar educational levels. In more of 20% of the cases, the man has a higher vocational education and in about 10% this is reversed. We can assume that these percentages hold for both parts of Germany and can adopt them to the skill level groups of our dataset (see Figure 13 and Figure 14).[12]

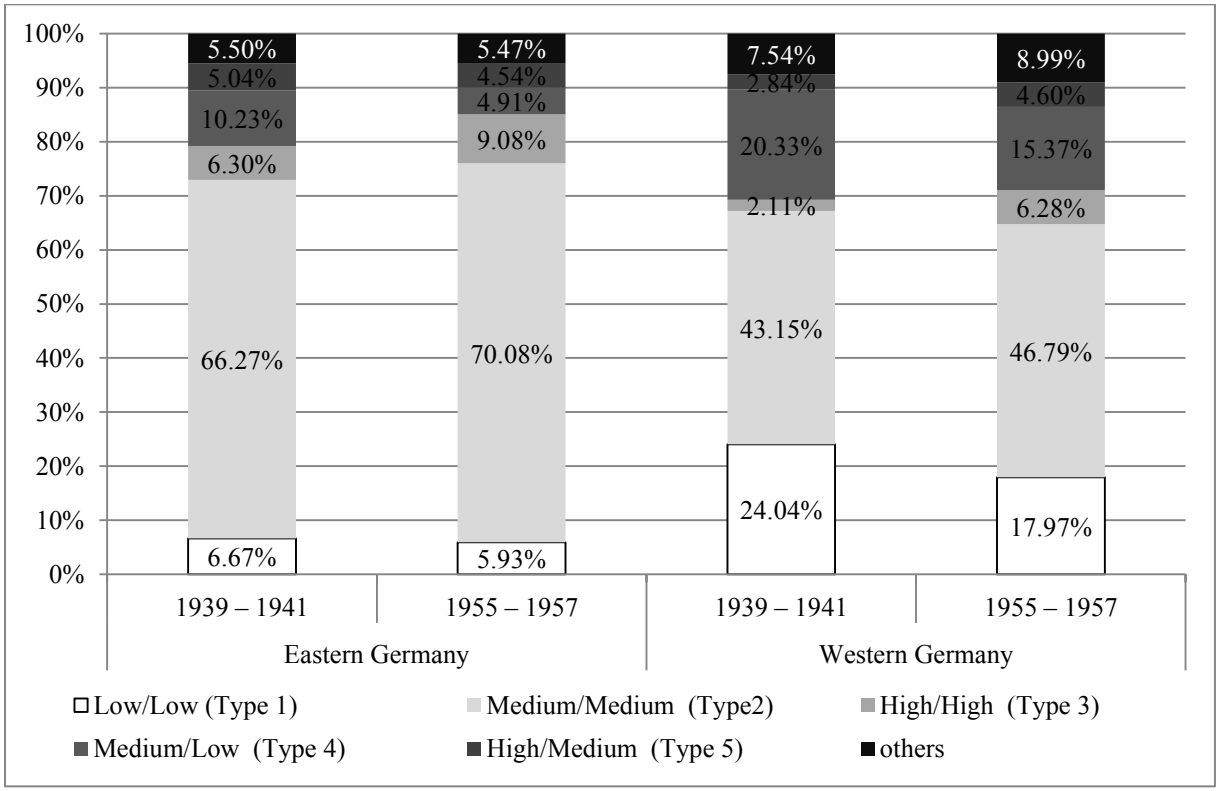
Our procedure is the following. First, we match men and women with the same skill level. The remaining men are matched with females of a lower educational level. The remaining females are assigned to a man with higher education. The following example illustrates our method and its restrictions. We observe 1,000 medium-skilled men and 1,000 medium-skilled women in a cohort. 60% of all men and women are matched with partners of the same skill level. Subsequently, 400 medium-skilled women remain for a possible partnership with a high-skilled man. Assuming a low quantity of (for example) 100 high-skilled men. 60 are used for equally educated couples and only 40 remain for a partnership with a medium-skilled

[12] For simplicity we use all individuals of our dataset for the matching process.

woman. Therefore the number of couples with a higher skilled man and a lower skilled woman is always determined by the quantity of the group with fewer members in the dataset and we cannot match all individuals.[13] Thereby the case of higher skilled women is excluded, because of technical matters and their minor relevance. For the same reasons we exclude relationships being separated by two skill levels.

Figure 17 summarizes the resulting percentages of partnership combinations. The five different household-types capture over 90% of all partnership constellations in Germany [see Federal Statistical Office Germany (2008)].

Figure 17: Shares of Different Relationships with Respect to all Two-Person Households



Source: authors' calculations.

Using this skill distribution, we can construct a model to describe the household incomes received from the statutory pension insurance. The method used to create a detailed picture of the households' statutory pensions is to generate random distributions of old-age income for

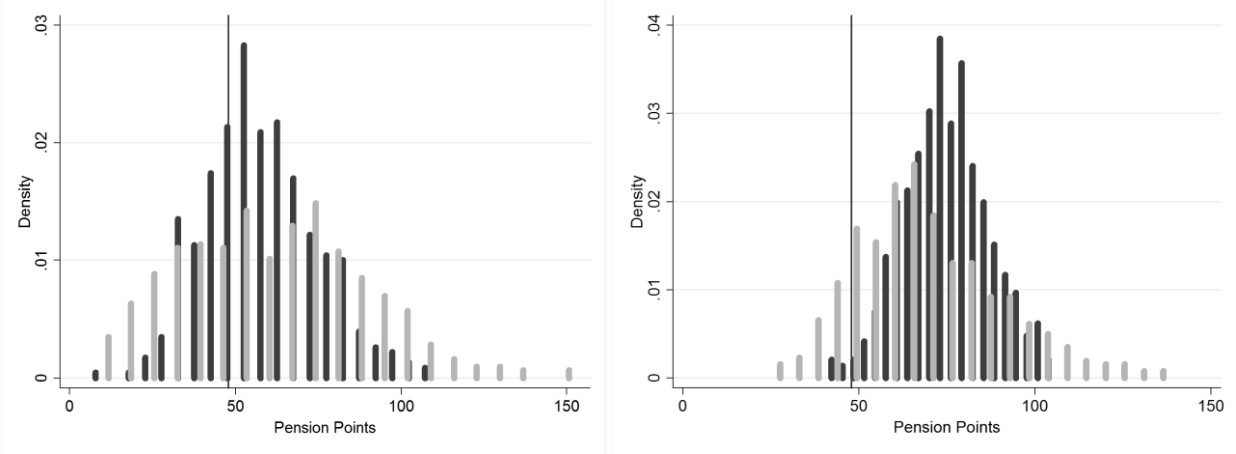
[13] A maximum of 4% of a skill group is left after the matching process.

the different partnership constellations. We stochastically combine males and females according to their education level, place of residence (Eastern or Western Germany) and cohort.[14] As a result we get EP distributions for the five main types of households (compare Figure 17). We will begin with the most common combination of medium-skilled men and women.

[14] A description of the matching method can be found in the appendix.

Figure 18: Earning-Point-Distribution of Two-Person Households

Western Germany **Eastern Germany**



	Western Germany		Eastern Germany	
Skill Levels	1939-41	1955-57	1939-41	1955-57
Low/Low (type1)	44.99%	54.24%	7.11%	48.23%
Medium/Medium (type2)	18.64%	30.09%	0.42%	12.34%
High/High (type 3)	16.19%	21.05%	None	5.01%
Medium/Low (type 4)	24.22%	38.70%	1.35%	22.19%
High/Medium (type 5)	18.13%	25.55%	None	8.35%
All	28.57%	34.29%	1.27%	12.55%

Source: authors' calculations.

Although the "old" cohort (1939 to 1941) of type 2 (medium-medium-partnership) households in both parts of Germany faces a relatively low old-age poverty risk (West: 18%; East: 0.42%) this percentage increases over time (in the 1955 to 1957 cohort). In Eastern Germany the growth is dramatic but the rate is still lower than in Western Germany (30% vs. 12%). Besides increasing unemployment, civil servant status and self-employment induce a growing heterogeneity of incomes. Most of the people in these age groups seem to be protected against old-age poverty by the statutory pension. This result is confirmed even more

if we bear in mind the possibility of additional private and/or occupational pensions, especially in Western Germany.

In Eastern Germany, the medium-low-relationship (type 4) has a share of 5 to 10% (see Figure 17). In Western Germany and medium-low-partnership combination show has a share of 15 to 20%. Also the share of low-low-partnerships (type 1) is higher in Western Germany. The main reason for this is the higher percentage of low-skilled people in Western Germany. Especially type 1 households have a very high risk of old-age poverty. The situation for medium-low-relationships is similar to that of medium-medium households. The old-age poverty risk of the medium-low-partnership, however, is on a higher level. One plausible explanation for this may be the poor labor market opportunities for low-skilled women. In consequence, the financial situation for such partnership is more problematic than for type 2 households. In particular, type 4 households of the "young" cohort face a higher old-age poverty risk (38% resp. 22%) in both parts of Germany.

As might be expected, the low-low households show the highest old-age poverty risk. Like single low-skilled males only the "old" cohort in Eastern Germany generates a sufficient level of statutory pension (93% over 48 EP). In Western Germany this group represents about 20% of all two-person households. For the "young" cohort in Eastern Germany, the same statements as for singles can be made. The risk will increase dramatically (7% for the "old" cohort vs. 62% for the "young"). Due to the problem of missing private and/or occupational pension schemes these persons will probably need additional social transfers to reach basic income security.

The two remaining type 3 and 5 represent a small number of relationships but for these groups we expect no old-age poverty. We can observe about 20% of households under the 48 EP thresholds. But, as in the case of singles, the majority of couples below the critical threshold is presumably protected outside the statutory pension system (civil service or self-employment).

Again the ratio is increasing over time because of alternative career opportunities (civil servant or self employed). Also the possibility of additional private and occupational protection is much higher for these groups [see Deutsche Rentenversicherung Bund (2007)]

3.7 Widows

Widows are the best protected group with respect to the statutory pension system in our analysis.[15] In Eastern Germany widows face almost no risk of old-age poverty. For widows we use the results of two-person household analysis with a different critical limit (30 EP as for singles). Methodically, we assume the household qualification types also for widows (see Table 6). The pension is calculated in a simple way: A widow gets her own pension and in addition 55% of the claim of the deceased partner. Currently there are more specific rules for a dependent's pension.[16] These calculations apply at an income above the old-age poverty level. Therefore this has no impact on our analysis of old-age poverty risk.

[15] In what follows we concentrate on widows, because their numbers are much higher than widowers. In the group of those over 76 years, widows are the largest group (and growing), while the ratio of widowers is constant over time at a low level. Furthermore, men show a lower old-age poverty risk than women. An additional dependent's pension improves their old-age income situation further. We cannot calculate the widow pension for woman without any earning point. Years of education as well as children create pension claims in Germany. Therefore almost every woman has at least a small pension claim.

[16] There are several rules for cases in which the spouse dies before he/she was a pensioner. To make the analysis easier we can assume that the spouse reaches pension age. This assumption has a weak effect, because if the spouse dies before retirement age, the widow's pension is calculated on the basis of a hypothetical pension (reaching the regular pension age) with deductions [Deutsche Rentenversicherung Bund (2012)]. A description of the methodology can be found in the Appendix.

Table 6: Percentage of Widows Below 30 EP in Respect to all Widows of the Same Type

	Western Germany		Eastern Germany	
Skill Levels	1939-41	1955-57	1939-41	1955-57
Type 1 Widow (L/L)	49.45%	44.99%	4.74%	31.42%
Type 2 Widow (M/M)	14.88%	25.78%	0.77%	5.01%
Type 3 Widow (H/H)	11.21%	16.80%	None	0.90%
Type 4 Widow (M/L)	21.98%	37.29%	1.13%	14.79%
Type 5 Widow (H/M)	13.64%	20.21%	None	2.04%
All	27.49%	28.79%	1.27%	5.65%

Source: authors' calculations.

If we compare the risk of old-age poverty for widows to the risk in two-person households, we can observe a lower poverty risk for widows of each type. This is because of the enhancement of the old-age income by the additional dependent's pension often outweighs the loss of the economic advantages of a two person household (economies of scale). Thereby the poverty threshold for two-person households plays an important role. The groups with the highest risk of old-age poverty are low-skilled widows of medium or low-skilled deceased men (type 1 and 4). The main reason is the low pension claim of the widow, which cannot be compensated by the added 55% EP of the deceased partner. In cases of medium-skilled men an additional private and/or occupational pension seems to be more likely as well as life insurance. In contrast, type 1 widows face the highest risk of old-age poverty.

In other cases the percentage of widows with an old-age poverty risk is about or below 20%. Also the possibility of additional pension provisions seems to be higher here, especially in cases of high-skilled deceased partners. In Eastern Germany, widows of type 2, 3 and 5 reach a secure level of old-age income by statutory pension. The reason for that is the higher rate of full-time female employees and consecutively the higher level of their own EPs. In Western

Germany the percentages are higher because of the lower pension claims of the widows and the more heterogeneous income structure (see elderly singles).

3.8 Conclusion

At the beginning we posed the question of whether there is a growing risk of old-age poverty in Germany. Comparing the new pensioners in 2004-2006 with those of the period 2020-2022, we found that, in general, the risk of post-retirement poverty increases for the latter group. With the exception of single females, we observed a growing poverty risk for all household types. The analysis shows also the importance of qualifications. Independent from the marital status, a higher skill level significantly decreases the risk of poverty in old age.

What are the specific findings for Eastern Germany? The poverty risk for single males rises. The situation of single females seems to be unchanged over time. The situation of couples worsens a little, but is still on a secure level. Widows are the best protected household group in Eastern Germany. On average, they have not and will not have any greater problem in the future. Is the situation in Eastern Germany worse than in Western Germany? Because of the still prevailing employment biographies in the former GDR (with no unemployment), the situation in 2004 – 2006 and in 2020 – 2022 is better in Eastern Germany. In Western Germany unemployment began to be an issue in the mid-seventies. This is true for almost every skill level, for every type of household and for both men and women.

3.9 References

Arent, S and Nagl, W (2010), A Fragile Pillar: Statutory Pensions and the Risk of Old-Age Poverty in Germany, *FinanzArchiv* 4 (66), 2010, 419-441.

BMFSFJ (2000), Partnerschaft und Familiengründung - Die Hauptresultate des ersten Ergebnisbandes des Familiensurvey III, Bundesministerium für Familie, Senioren, Frauen und Jugend, Berlin.

Deutsche Rentenversicherung Bund (2007), Altersvorsorge in Deutschland 2005, Deutsche Rentenversicherung Bund, Berlin.

Deutsche Rentenversicherung Bund (2012), Hinterbliebenenrente: Hilfe in schweren Zeiten, Deutsche Rentenversicherung Bund, Berlin.

Federal Statistical Office Germany (2008), Bevölkerung am 31.12.2007 nach Altersjahren und Familienstand, Wiesbaden.

Federal Statistical Office Germany (2008), Familienland Deutschland, Statistisches Bundesamt, Wiesbanden.

Gühne, M., Kumpmann, I. and Buscher, H. S. (2012), Armut im Alter : Ursachenanalyse und eine Projektion für das Jahr 2023“, *Jahrbücher für Nationalökonomie und Statistik* (232), 61-83.

IABS-R04, IAB-Beschäftigtenstichprobe: Scientific Use File Regionalfile 1975 - 2004, Nuremberg.

VSKT (2005), SUF FDZ-Biografiedatensatz - VSKT2005 Quelle: FDZ-RV, Berlin.

3.10 Appendix

i) *Methodology of creating couples*

To create couples, we use the skill and gender specific EP information. As a first step we bootstrap the skill specific samples of men and women to generate samples with an equal number of observations (expect the group of high skilled women). Second, we randomly match 60% of men and women with the same skill level. In 60% of all couples, both partners have the same skill level. We randomly match the remaining males with females of a lower educational level. A small number of high-skilled women and low skilled men are not matched. The following example illustrates the method. We observe 1,000 medium-skilled men and 1,000 medium-skilled women in a cohort. 60% of them are combined with partners of equal education.[17] We create 600 random medium-medium-couples. (We do so for all three skill levels). Subsequently, 400 medium-skilled men and women are left. The 400 medium skilled males are randomly matched to low skilled women and the 400 medium skilled females are randomly matched high skilled males. Therefore the number of couples with a different skill level is always determined by the quantity of the group with fewer members in the dataset. For example, if we observe 100 high skilled men and 100 high skilled women. 60% of them are randomly matched to high-high-couples. Thus 40 men are left for matching with medium skilled women. The calculation for low skilled is analogous. Because of its minor importance and to ease the calculation we exclude the case of couples in which the women has a higher skill level as the men. All matches consider the place of residence (Eastern or Western Germany) and the birth cohort. We assume the same cohort and the same place of residence for men and women.[18]

[17] We cannot observe the marginal distribution of partnerships with an equal education.

[18] This assumption is somehow critical because usually the female partners are younger than the male. Our results show the old-age income for couples if both partners are retired.

ii) *Calculation of widow pensions*

To calculate the widow's pension, we use the information about couples and add 55% of the man´s pension to the pension of the woman.[19] Our methodology suggests that the males reach the pension age before dying. We may overestimate the widow´s pension because of this assumption. The over estimation does not bias the analysis that much, because the institutional framework of the German statutory pension secure widows even if the partner dies before the pension age [Deutsche Rentenversicherung Bund (2012)]. The minimum widow's pension claim is based on a hypothetical pension level for which the deceased would have been 60 years old.[20]

[19] Years of education as well as children create pension claims in Germany. Therefore almost every woman has at least a small pension claim.

[20] For simplicity we assume the year of death as being equal to the year of his retirement.

4 Unemployment Compensation and Wages: Evidence from the German Hartz-Reform[1]

by Stefan Arent and Wolfgang Nagl

4.1 Introduction

In this paper, we examine the effect of decreasing unemployment compensation (UC) payments on wages in Germany. Economic theory predicts that decreasing UC leads to decreased wages and higher rates of employment. This effect is the result of a decreased outside option in the context of wage bargaining and has been extensively modeled in the literature on searching models (see Rogerson et al. 2005). Empirical findings from the US support this prediction but evidence for Germany is missing. We fill this gap by using the Hartz reforms as a quasi natural experiment.

Two approaches can be used to examine empirically the effect of decreased UC on wages. The first approach is to measure the effect of UC on (reservation) wages by using survey data (see Feldstein and Poterba 1984, Addison et al. 2009 or McCall and Chi 2008). These studies use detailed individual information about reservation wages and examine whether the level of UC affects the reservation wage by a cross section analysis (comparing different US states or EU countries). The second approach is to measure the direct effect of UC on wages using administrative data (see Topel 1984). This approach has the advantage of large sample sizes. To determine the effect of decreased UC on wages, we follow the second approach, using exogenous variation of the UC that is generated by a quasi-natural experiment resulting from an extensive reform of the German labor market: the Hartz reforms. As a result of the Hartz reforms, the decreased unemployment assistance (UA) for individuals who are unemployed in

[1] This chapter is accepted for publication. Forthcoming in Jahrbücher für Nationalökonmie und Statistik (Journal for Economics and Statistics).

the long-term generates exogenous variation in the UC payments.[2] The Hartz reforms were implemented between 2003 and 2006.

The main components of these reforms include increasing the flexibility of the labor market and decreasing the overall amount of UA [see Jacobi and Kluve (2007)]. Prior to 2005, UA was calculated as a fraction of the individual's earnings. Since 2005, however, the UA is means-tested and is not related to an individual's income. We use panel data from the Federal Employment Agency of Germany (2008) [BA-Employment Panel 1998-2007] to analyze the effect of this UA reduction on wages. Former studies do not have the opportunity to use a quasi-natural experiment in combination with such detailed data. We use a sample of 2 percent of all employees that were subject to social insurance contribution in Germany.

The remainder of this chapter is organized as follows. Section 4.2 gives an overview of the German Hartz reforms. Section 4.3 describes our data. In Section 4.4, we explain our method and estimation strategy. In Section 4.5, we show empirical evidence for a decreasing wage effect. Section 4.6 concludes this study.

4.2 The German Hartz-Reform

The Hartz reforms constitute the most comprehensive German labor market reform of the last decade.[3] The Hartz reforms consist of four parts. Hartz I and Hartz II increase the flexibility of the German labor market; these reforms were introduced at the beginning of 2003. The primary components of the reforms were designed to ease temporary work, to introduce a new start-up grant scheme and to liberalize the Mini-Jobs legislation.[4] Hartz III governs the

[2] In the following we use term unemployment assistance because the Hartz-reform affects the unemployment compensation, the social assistance and the unemployment assistance.

[3] A good overview of legislative German labor market reforms since 1990 is provided by Ebbinghaus and Eichhorst (2006).

[4]For Mini Jobs (earnings up to 400 €) the contribution rate to the social insurance is decreased than for regular employment subjected to social insurance contribution.

reorganization of the German Federal Employment Agency. Hartz-IV is the most important Hartz reform for the empirical examination and consists of two main components.[5]

The first and most important aspect of Hartz IV is the introtuction of a fixed and means-tested UA payment (ALG II) on the 1st of January 2005. Prior to this date, the UA was determined by 53% (or 57% with a child) of the individual's former net wages. In 2005, the UA transitioned to a means-tested and non-income-related payment at a fixed level of 345 € plus means-tested housing costs.[6] Furthermore, after 2005, the law clearly stipulates that unemployed individuals must accept reasonable offers of employment. If an unemployed individual refuses a reasonable offer of employment, then his or her UA is reduced [Social Security Code; SGB II §31 et seq].

Second, UA payments are now means-tested. If an individual has significant financial assets or if the individual's partner has a sufficiently high income, his or her UA payments could decrease to zero. Schulte (2004) shows that after 2005, the overwhelming majority of German households' financial assets do not exceed the maximum asset allowance of the UA. Like financial assets the spouse's income plays a significant role in determining an unemployed individual's UA payments. The Hartz-IV reform decreases the amount of the UA for 59% of households; 25% of all households lose the entirety of their UA claim. Couples without children are particularly affected by the Hartz-IV reform. Nearly every other couple without children (47%) loses their UA claim completely. For 82% of childless couples, the UA claim amount is decreased as a result of the reform. However, 72% of single-parent households receive a higher UA claim amount after 2005. On average, for single-person households and

[5] In addition top-up benefits has been introduced to ease the re-employment of long-term unemployed via a wage subsidy.

[6] The ALG II replaced the two previous, parallel systems of non-means-tested unemployment assistance and means-tested social assistance.

couples with more than one child, the UA situation does not change substantially as a result of the Hartz-IV reform [Schulte (2004)].[7]

The third important feature of the Hartz-IV reform was the shortage of the maximum period an individual was entitled to receive unemployment benefits (ALG I) to 18 months, effective on February 1st, 2006.[8] The length of benefits entitlement depends on the length of the individual's former employment and age. The minimum qualifying requirement to receive a short-term unemployment benefit (ALG I) for 6 months is a period of 12-month employment during the last 2 years. The ALG I is 60 % (or 67 % with a child) of individual's previous net wage. The ALG I is not means-tested and has a maximum payment level.[9] All components of the Hartz-IV reform reduce the expected value of financial support during unemployment.

4.3 Data

We use the BA-Employment Panel 1998-2007, which consists of 2 percent of all employees that were subject to social insurance contribution and are unemployed in Germany.[10] This dataset is representative for those persons and contains quarterly information for individuals and firms from the first quarter of 1998 until the last quarter of 2007. We restrict our analysis to a balanced panel from the first quarter of 2000 to the fourth quarter of 2007. Prior to 2000, it was not possible to track individuals through periods of unemployment. Because we are interested in the effects of decreased UA payments on regular employees, we focus on full-time employees. Our sample contains all individuals who worked at least one quarter between the first quarter of 2000 and the fourth quarter of 2007 or were registered as unemployed.

[7] Single person households with a net income of more than 1404€ are affected by the Hartz-IV-reform.

[8] The legislation was later changed so that the maximum period is now 24 months for older employees.

[9] The upper limit of ALG I depends on the (social security) contribution assessment ceiling.

[10] A detailed description of the data can be found in Schmucker and Seth (2009)

Our sample contains the following data on individuals: sex, age, wage, employment status, job tenure, education, type of employment and unemployment status. All information is collected at the end of each quarter. The wage is reported as the nominal gross salary per month. To avoid a time trend of the dependent variable, we calculate the real gross salary per month by using the German Harmonized Index of Consumer Prices [Federal Statistical Office of Germany (2011a)]. The real wages were stationary between 2000 and 2007.[11] The employment status is reported by the employer and is classified into four groups: unskilled blue-collar workers, skilled blue-collar workers, foremen and white-collar workers (the reference group). The job tenure is measured as an individual's duration (in quarters) of employment at a given firm. Education level is classified into three groups: low-skilled, medium-skilled and high-skilled. Workers without vocational training are classified as low-skilled, workers who have completed vocational training are classified as medium-skilled, and workers with academic degrees are classified as high-skilled employees. Skill level and employment status can differ, thus we use both.

For the empirical estimation, we use the following firm-specific information: firm size, industry and the age structure of the employees. The firm size is classified into three groups. A small firm has less than 50 employees and a large firm has more than 200 employees. We use medium size firms, classified as having between 50 and 200 employees, as a reference group. We distinguish the following industries: construction, manufacturing, wholesale and retail trade, real estate, rental and business activities, transport, storage and communication and financial intermediation.[12] The age structure of a firm is described by the share of older (>55 years of age) and younger (<20 years of age) employees. These variables are intended to

[11]Since we observe a fixed number of time periods, we applied the Harris-Tzavalis test for stationarity [Harris and Tzavalis (1999)]. The non-stationarity hypothesis is only not discarded for low-and high-skilled women in Eastern and Western Germany in the Construction Industry. These two groups are too small to allow reliable test results. The use of alternative inflation data [BIP Deflator] does not change the results.

[12] The industries follow the European national accounting system [Federal Statistical Office of Germany (2007)].

absorb effects of the firms' age structure. To account for the influence of business cycles, we include the industry-specific gross value added (real annual value, base year: 2000) [Federal Statistical Office of Germany (2010)] and dummy variables for each quarter.

Because of structural differences in the labor markets, we divide the dataset into Eastern and Western Germany [see Kronthaler (2003) or Smolny (2009)]. This segmentation is based on job location. To avoid misreported wages in our analysis, we truncate our data at the 5th percentile and at the 95th percentile. Moreover information about wages above the maximum level that must be reported for social insurance contributions are reported voluntarily and often missing. If the wage is not reported voluntarily, the maximum level for social insurance contributions is reported instead. Truncating the wages avoid these problems. After these restrictions, our sample still contains 136, 949 men and 49, 240 women in Western Germany and 25, 995 men and 17, 419 women in Eastern Germany.

4.4 Methodology

Theory predicts that the level of UA payments affects the wages. Wage bargaining models as well as search models predict, that a hike in the UA increases the outside option and therefore the wage [see Rogerson et al. (2005)]. Thus, the wage is a positive function of the UA. Therefore, decreasing the UA should decrease wages. The introduction of the means-tested, non-income related UA in 2005 is a quasi-natural experiment in which the UA decreases. The decrease of the UA weakens the worker's outside option and decreases the worker's bargaining power in individual or collective wage bargaining [see Rowthorn (1999)]. This may induce moderate wage claim.

Our estimation strategy is consistent with the idea of a structural break in the German labor market in 2005. We identify this structural break using a Chow-test.[13] We do not detect a structural break for the shortening of short-term unemployment benefits entitlement periods in 2006. We estimate the effect of introducing means-tested, non-income related UA payments on the real wage in 2005 using the following empirical model:[14]

$$\ln(w)_{it} = \beta_0 + \beta_1 lowerUA_t + controls + a_i + u_{it}. \qquad (3.1)$$

The logarithmic value of the real wage w of each employed individual i in period t is estimated with a constant β_0, a time dummy variable to measure the effect of the lower UA ($lower\ UA_t$), several control variables, a personal fixed effect a_i and an error term, u_{it}. The variable $lower\ UA$ is equal to unity after 2005.

Because the decreased UA payments affect all socially insured employees, it is not possible to identify a treatment and a control group to isolate the pure effect of the lower UA. Nevertheless, we are confident that the parameter β_1 reveals the effect of the lower UA on wages for unemployed individuals. We are confident about this conclusion because we are able to isolate the effect of the $lower\ UA$ dummy variable by using a wide set of control variables and sensitivity tests. Our model controls for age, age squared, professional status, firm size, the firm's age structure, individual job tenure, annual values of the industry-specific gross value added per worker and dummy variables for each quarter.[15] The industry-specific gross value added and the dummy variables for each quarter are included to account for time

[13] To find additional support for the results of the Chow-test, we split our sample into two sub-samples: before (year 2003) and after the introduction (year 2007) of the means-tested UA payments. We exclude the period from 2004 to 2006 to avoid transition effects. The pooled regressions for both sub-samples show a significantly lower constant after the reform for everyone in the sample except for Eastern German men. The remaining coefficients are quite similar [See tables in the Appendix].

[14] Link tests [Pregibon (1980)] support the dependent variable in logarithmic values. Furthermore, it allows an analysis of the relative effect of the reform, regardless of income level.

[15] We cover possible seasonal effects with dummy variables for each quarter other than the first quarter of the year.

fixed effects.[16] In a balanced panel with a fixed effects model, the age variables account for a portion of the time trend effects.[17]

Because we are interested in the variation in wages over time, we run individual fixed effect (FE) regressions. In a first step model, we estimate our empirical model separately for men and women in Eastern and Western Germany. This estimation gives a first impression of the effect of decreased UA payments on wages. In a second step model, we study skill-specific and industry-specific effects. Because of the information on skill, sex, industries and region for each worker does not vary over time, we estimate the model for men and women and the three skill levels for six different industries, according to the European national accounting system [see Federal Statistical Office of Germany (2007)] for Eastern and Western Germany.[18] We only analyze industries with a share of more than 4 percent of all employees.[19]

[16]We use the industry-specific gross value added instead of the unemployment rate because there are no data on industry specific unemployment in Germany.

[17] To ensure that the lower UA dummy does not simply mirror decreasing wage returns to age, we estimate our model as a sensitivity test without the age variables. Our results remain stable and are robust to this model specification. As a further sensitivity test, we estimate placebo regressions with artificial reform variables. Instead of the variable lower UA, we introduced dummy variables for artificial reforms in every year except for 2005. After 2004, the effect of the artificial reform dummy variable becomes negative. This effect is quite small when compared to the negative effects observed in 2005, 2006 and 2007. This result supports the assumption that the wage-dampening effect of the Hartz reforms begins to occur in 2005. The results of the sensitivity tests can be found in the Appendix.

[18] An aggregate estimation with dummy variable for each industry would be biased. By using a fixed effect estimation with dummy variables for the different industries, the coefficients of these dummy variables would be driven by the minority of inter-industrial mobile workers. Theory and empirics [Neal (1995)] show that inter-industrial mobility is small.

[19] Overall, the chosen six industries contain more than 96% of the working population in the private sector between 2000 and 2007 [Federal Statistical Office of Germany (2011b)].

4.5 Results

In this section, we provide evidence that the introduction of the decreased UA in 2005 leads to a decrease in wages. In Table 7, we first present the empirical evidence for men and women in Eastern and Western Germany, irrespective of industry and skill level.

Table 7: FE Estimation Results for Men and Women in Eastern and Western Germany

	Western Germany		**Eastern Germany**	
Dependent Variable: ln(wage)	men	women	men	women
Constant	7.1851***	6.8753***	7.1069***	6.8522***
	(0.0093)	(0.0154)	(0.0233)	(0.0314)
Lower UA	-0.0240***	-0.0259***	-0.0200***	-0.0271***
	(0.0002)	(0.0004)	(0.0006)	(0.0007)
Age	0.0346***	0.0400***	0.0248***	0.0303***
	(0.0004)	(0.0006)	(0.0009)	(0.0013)
Age^2	-0.0004***	-0.0004***	-0.0003***	-0.0003***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Unskilled blue collar worker	-0.0759***	-0.0538***	-0.0858***	-0.0644***
	(0.0026)	(0.0056)	(0.0065)	(0.0097)
Skilled blue collar worker	-0.0590***	-0.0407***	-0.0713***	-0.0605***
	(0.0023)	(0.0060)	(0.0058)	(0.0089)
Foreman	0.0036	0.0018	-0.0016	0.0289
	(0.0036)	(0.0167)	(0.0101)	(0.0206)
Small firm	-0.0240***	-0.0233***	-0.0201***	-0.0215***
	(0.0009)	(0.0018)	(0.0021)	(0.0030)
Large firm	0.0230***	0.0211***	0.0247***	0.0127***
	(0.0009)	(0.0016)	(0.0026)	(0.0027)
Firm's share of young employees	-0.0129***	-0.0341***	0.0139	0.0203*
	(0.0042)	(0.0064)	(0.0093)	(0.0116)
Firm's share of old employees	-0.0123***	-0.0284***	-0.0209***	-0.0134*
	(0.0030)	(0.0049)	(0.0063)	(0.0073)
Industrial-specific gross value added	0.0005***	0.0002***	0.0005***	0.0005***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Job tenure	0.0014***	0.0005***	0.0016***	0.0008***
	(0.0000)	(0.0000)	(0.0000)	(0.0001)
2^{nd} Quarter	-0.0043***	-0.0040***	-0.0043***	-0.0040***
	(0.0000)	(0.0000)	(0.0001)	(0.0001)
3^{rd} Quarter	-0.0088***	-0.0078***	-0.0092***	-0.0082***
	(0.0000)	(0.0001)	(0.0002)	(0.0002)
4^{th} Quarter	-0.0101***	-0.0089***	-0.0094***	-0.0084***
	(0.0000)	(0.0001)	(0.0002)	(0.0002)
R^2 (overall)	0.33	0.11	0.31	0.17
R^2 (within)	0.08	0.07	0.05	0.04
obs.	4 064 672	1 403 530	728 539	491 444

Industry-specific gross value added per worker is given annually.

Source: authors' calculation. Significance-level: *** p<0.01, ** p<0.05, * p<0.1.Standard errors in parentheses.

For men and women in Eastern and Western Germany, we find a highly significant, negative effect of the lower UA variable. The estimated coefficients presented in Table 7 are the marginal effects. In Western Germany, the decreased UA variable ceteris paribus shows a 2.4 % decrease in wages for men and a 2.6 % decrease in wages for women after 2005. In Eastern Germany, the effect is smaller for men (2.0 %), but higher for women (2.7 %). The negative coefficient of lower UA does not imply that wages decreased after 2005. The overall wage would only have decreased if all other variables would have remained constant in the absence of the Hartz reforms. The effect is higher for women in both parts of Germany. The absolute effect of the lower UA is stronger in Western Germany.[20]

To allow a more detailed analysis, we now present the results for the skill-specific and industry-specific estimations. This study included 72 regressions in total. We estimate fixed effect regressions to identify the effect of the lower UA for men and women, six industries and three skill levels in Eastern and Western Germany. Table 8 and Table 9 present the marginal effect of the lower UA dummy variable with respect to the industry, skill and gender of the worker.

[20] In the Appendix, we present the estimation results for the dependent variable of wage in absolute values.

Table 8: Marginal Effects of Lower UA on the Logarithmic Wages with Respect to Industry, Gender and Skill Level in Western Germany

	Construction industry	Manufacturing industry	Wholesale and retail trade	Real estate, renting and business activities	Transport, storage and communication	Financial intermediation
			Men			
Low	-0.0195***	-0.0158***	-0.0196***	-0.0289***	-0.0225***	-0.0240***
	(0.0029)	(0.0009)	(0.0028)	(0.0044)	(0.0026)	(0.0071)
R^2 (within)	0.10	0.04	0.05	0.03	0.08	0.18
Obs.	30,828	226,234	41,384	15,388	33,231	4,476
Medium	-0.0223***	-0.0166***	-0.0266***	-0.0266***	-0.0205***	-0.0287***
	(0.0009)	(0.0004)	(0.0009)	(0.0013)	(0.0011)	(0.0012)
R^2 (within)	0.10	0.10	0.07	0.08	0.06	0.29
Obs.	292,236	1,254,838	475,837	192,017	213,330	122,192
High	-0.0243***	-0.0276***	-0.0600***	-0.0432***	-0.0282***	-0.0411***
	(0.0037)	(0.0007)	(0.0033)	(0.0015)	(0.0047)	(0.0021)
R^2 (within)	0.15	0.33	0.22	0.21	0.20	0.44
Obs.	13,532	194,734	36,564	104,933	8,915	28,022
			Women			
Low	-0.0174	-0.0169***	-0.0283***	-0.0315***	-0.0139**	-0.0130**
	(0.0108)	(0.0014)	(0.0042)	(0.0061)	(0.0065)	(0.0058)
R^2 (within)	0.14	0.04	0.05	0.11	0.09	0.11
Obs.	1,097	82,843	18,914	6,502	4,613	6,394
Medium	-0.0103**	-0.0150***	-0.0295***	-0.0283***	-0.0190***	-0.0247***
	(0.0044)	(0.0011)	(0.0015)	(0.0020)	(0.0028)	(0.0018)
R^2 (within)	0.04	0.09	0.06	0.07	0.08	0.18
Obs.	20,589	206,480	205,593	109,517	47,000	84,399
High	0.0283	-0.0215***	-0.0454***	-0.0443***	-0.0110	-0.0406***
	(0.0252)	(0.0043)	(0.0073)	(0.0058)	(0.0157)	(0.0072)
R^2 (within)	0.07	0.10	0.06	0.07	0.14	0.12
Obs.	1,594	20,417	11,030	21,302	2,836	8,252

Dependent variable: ln(wage)

Controls: age, age^2, professional status, firm-size, firm´s age structure, industry-specific gross value added per worker, job tenure, quarter dummies

Source: authors' calculation. Significance-level: *** p<0.01, ** p<0.05, * p<0.1.Standard errors in parentheses.

In every industry, for nearly all skill levels and for both genders, we confirm the highly significant negative coefficients of the general estimations for Western Germany [see Table 8]. For the largest subsample of medium-skilled men in the manufacturing industry in Western Germany, the marginal effect of lower UA is -1.7 %, ceteris paribus. After controlling for the industry-specific effect, there is no clear evidence whether the effect of the lower UA is stronger for men or women. In many industries, for both men and women, the effect of the lower UA increases with the worker's skill level. The higher effect for high-skilled workers may be driven by a stronger decrease of the UA level. Recall that after 2005, the level of the UA is independent from the individual's wage. After 2005, the lower fixed levels of UA payments significantly weaken the fallback position of highly qualified workers.

Bargaining theory predicts that the effect differs with the grad of unionization. The differences between industries are not systematic. For the construction and manufacturing industry, as well as for transport, storage and communications, the effect is smaller in contrast to the effect on the wholesale and retail trade industry, the real estate industry, the rental and business activities industry, as well as to the financial intermediation industry. More powerful unions may be the reason for that.

In Eastern Germany, the lower UA has a significant negative effect, but the effect is smaller than in Western Germany. For medium-skilled men in the manufacturing industry, the effect of the lower UA on wages is only 1.3 %. In contrast to Western Germany, we do not observe any clear pattern in the effects of the lower UA with respect to gender, skill and industry. Accounting for an industry-specific effect, we find no systematic difference between the effects on men and women. Furthermore, the level of the effect is detached from the skill level. In this regression, is also impossible to identify an industry-specific pattern [see Table 9].

Table 9: Marginal Effects of Lower UA on the Logarithmic Wages with Respect to Industry, Gender and Skill Level in Eastern Germany

	Construction industry	Manufacturing industry	Wholesale and retail trade	Real estate, renting and business activities	Transport, storage and communication	Financial intermediation
			Men			
Low	-0.00656	-0.0123*	-0.00300	-0.0143	-0.0238***	-0.0160
	(0.0125)	(0.0067)	(0.0075)	(0.0115)	(0.0060)	(0.0348)
R^2 (within)	0.122	0.064	0.120	0.085	0.155	0.484
Obs.	2,183	7,250	2,541	1,373	3,235	210
Medium	-0.0139***	-0.0125***	-0.0128***	-0.0197***	-0.0232***	-0.0232***
	(0.0017)	(0.0012)	(0.0017)	(0.0029)	(0.0018)	(0.0050)
R^2 (within)	0.051	0.094	0.060	0.047	0.047	0.358
Obs.	101,932	160,340	84,415	36,364	67,524	7,873
High	-0.0326***	-0.0099***	-0.0132*	-0.0136***	-0.0126*	-0.0120
	(0.0097)	(0.0031)	(0.0071)	(0.0050)	(0.0074)	(0.0086)
R^2 (within)	0.123	0.218	0.100	0.099	0.215	0.227
Obs.	4,660	21,132	4,906	15,551	2,734	2,688
			Women			
Low	0.0249	-0.0152*	-0.0183*	-0.0268**	-0.0446**	-0.0159
	(0.0430)	(0.0083)	(0.0107)	(0.0133)	(0.0173)	(0.0133)
R^2 (within)	0.31	0.06	0.10	0.10	0.16	0.21
Obs.	199	4,325	1,533	896	838	398
Medium	-0.00801	-0.0139***	-0.0133***	-0.0222***	-0.0230***	-0.0120***
	(0.0070)	(0.0027)	(0.0022)	(0.0031)	(0.0027)	(0.0034)
R^2 (within)	0.05	0.05	0.05	0.03	0.11	0.11
Obs.	8,017	47,793	51,296	32,149	22,618	16,880
High	-0.0503***	-0.0142**	-0.0135*	-0.0069	-0.0508***	-0.0118
	(0.0185)	(0.0061)	(0.0080)	(0.0076)	(0.0181)	(0.0083)
R^2 (within)	0.05	0.16	0.08	0.02	0.12	0.17
Obs.	1,481	7,362	3,634	8,617	1,441	2,842

Dependent variable: ln(wage)

Controls: age, age^2, professional status, firm-size, firm´s age structure, industry-specific gross value added per worker, job tenure, quarter dummies

Source: authors' calculation. Significance-level: *** p<0.01, ** p<0.05, * p<0.1.Standard errors in parentheses.

4.6 Conclusions

Theory predicts that decreased amounts of UC should result in decreased wages. Using a 2% sample of all socially insured, full time employees in Germany, we find strong evidence that decreasing the amount of the UA results in decreased wages in Germany. As a new approach, we use micro panel data to examine the structural break in the German labor market that occurred in 2005 as a result of the Hartz-IV reform. This legislative reform of the labor market decreased the UA and was therefore a unique natural experiment. Prior to 2005, UA payments were calculated as a fraction of the individual's former wage. Beginning in 2005, the UA was distributed as a fixed, means-tested payment. Thus, the overall level of the UA decreased. Our findings show that the decrease in the UA has a negative effect on wages, ceteris paribus. In Western Germany, the effect is -2.4% for men and -2.6% for women, and the effect is -2.0% and -2.7% for men and women in Eastern Germany, respectively. [21] Our results amend previous findings that show a restraint effect of the Hartz–IV reform on the concession willingness of applicants [e.g., Rebien and Kettner (2011)]. We can show that the reform does not only affects new applicants but rather the whole wage structure. Furthermore, in Western Germany, the marginal effect of the decreased UA is higher at higher skill levels; this finding holds for both men and women. The increasing gap between former wage and UA can explain these findings. The industry-specific effect is often higher for men. In Eastern Germany, we do not detect a systematic, industry-specific difference between men and women, nor do we find a clear increase in the UA effect at increasing skill levels.

Besides the strong worldwide demand for German products, the negative wage effect of the Hartz-IV reform may also be responsible for the favorable labor market situation in Germany [German Council of Economic Experts (2011)]. The decreased amount of UA available weakens the bargaining position of workers and collective bargaining units, thereby

[21] In addition the Hartz-IV reform also increases the flexibility of the German labor market. An increasing flexibilization affects the lay-off risk of employees and therefore the wages [see e.g. Arent and Nagl (2011)].

weakening their wage claim amounts. More moderate wage agreements may explain the German economy's increased competitiveness after 2005. Moderate wage settings because of labor market deregulation can improve the situation for capital investments and increase the competitiveness of the economy [see Spector (2004)]. Capital investments become more attractive because the negative wage effect of the Hartz-IV reform reallocates profits to the capital owner. Future empirical research has to examine the possible increasing of employment and investments because of the labor market deregulation (decrease of the UA and flexibilization) in detail. In addition to bargaining models, our findings are also consistent with effects that would be predicted from a neo-classical labor market. A decreased UA decreases the implicit minimum wage, which leads to higher employment (decreased unemployment) that is accompanied by decreased wages.

Current studies support the positive employment effect. These studies show that the reform has increased the labor market's matching efficiency [Klinger and Rothe (2012)] and has reduced unemployment and the duration of individuals' unemployment periods [Krause and Uhlig (2011)]. Data from the German Federal Employment Agency (2012) show that the number of unemployed individuals and the unemployment rate decreased significantly after 2005. This finding also holds for long-term unemployed individuals, whose share of total unemployed individuals decreased from 46% in 2007 to less than 35% in 2010. At the same time, the rate of socially secured employment increased even during the 2008-2009 financial crisis. Moreover, current research [Koller (2011)] suggests that the effect of an increasing low-wage labor market, which is often subject to criticism in the public sphere of debate, is small (Western Germany) or nonexistent (Eastern Germany). To assess the welfare effects of the Hartz-IV reform, a joint analysis of the wage effect and the employment effect is needed. Future research should focus on both effects and their interaction effects to derive reliable political recommendations.

4.7 References

Arent, S. and Nagl, W. (2011), The Price of Security: On the Causality and Impact of Lay-off Risks on Wages, *ifo Working Paper No. 100*.

Addisson, J. T., Centeno; M. and Portugal, P. (2009), Do Reservation Wages Really Decline? Some International Evidence on the Determinants of Reservation Wages. *Journal of Labor Research* 30, 1-8.

Ebbinghaus, B. and Eichhorst, W. (2006), Employment Regulation and Labor Market Policy in Germany, 1991-2005. *IZA Discussion Paper* No. 2505.

Federal Employment Office of Germany (2012), Number of Unemployed and the Unemployment rate, http://statistik.arbeitsagentur.de/Navigation/Statistik/Statistik-nach-Themen/Statistik-nach-Themen-Nav.html , retrieved 15.06.2012, 14:10 h.

Federal Statistical Office of Germany (2007), Volkswirtschaftliche Gesamtrechnungen Inlandsprodukt nach ESVG 1995 – Methoden und Grundlagen. Fachserie 18 Reihe S.22, Wiesbaden.

Federal Statistical Office of Germany (2010), Gross domestic product, gross value added in Germany by Bundesland and East-West-Regions 1991 to 2009. Reihe 1, Band 1, Wiesbaden.

Federal Statistical Office of Germany (2011a), German Harmonized Index of Consumer Prices, https://www-genesis.destatis.de, retrieved 28.03.2011, 15:12 h.

Federal Statistical Office of Germany (2011b), Compensation of employees, gross wages and salaries in Germany by Bundesland and East-West-Regions 1991 to 2010. Reihe 1, Band 2, Wiesbaden.

Feldstein, M. and Poterba, J. (1984), Unemployment Insurance and Reservation' Wages. *Journal of Public Economics* 23, 141-167.

German Council of Economic Experts (2011), Assume responsibility for Europe – Annual Report 2011/12, Federal Statistical Office of Germany, Wiesbaden.

Harris, R. D. F. and Tzavalis, E. (1999), Inference for unit roots in dynamic panels where the time dimension is fixed. *Journal of Econometrics* 91, 201-226.

Jacobi, L. and Kluve, J. (2007), Before and After the Hartz Reforms: The Performance of Active Labour Market Policy in Germany. *Journal of Labour Market Research* 40 (1), 45-64.

Klinger, S. and Rothe, T. (2012), The Impact of Labour Market Reforms and Economic Performance on the Matching of the Short-term and the Long-term Unemployed. *Scottish Journal of Political Economy* 59 (1), 90-114.

Koller, L. (2011), Hartz IV und der Niedriglohnsektor – Bei vielen bleibt das Stück vom Kuchen gleich. *IAB-Forum* 1/2011, 34-39.

Krause, M. U. and Uhlig, H. (2011), Transitions in the German labor market: structure and crisis. *Deutsche Bundesbank Discussion Paper*, No 34/2011, 1-37.

Kronthaler, F. (2003), A Study of the Competitiveness of Regions based on a Cluster Analysis: The Example of Eastern Germany. *IWH-Discussion-Paper*, No. 179, 1-21.

McCall, B. and Chi, W. (2008), Unemployment insurance, unemployment durations and re-employment wages. *Economics Letters* 99, 115-118.

Neal, D. (1995), Industry-Specific Human Capital: Evidence from Displaced Workers. *Journal of Labor Economics* 13 (4), 653-677.

Pregibon, D. (1980), Goodness of link tests for generalized linear models. *Applied Statistics* 29, 15-24.

Rebien, M. and Kettner, A. (2011), Die Konzessionsbereitschaft von Bewerbern und Beschäftigten nach den Hartz-Reformen. *WSI Mitteilungen* 5/2011, 218-225.

Rogerson, R., Shimer, R. and Wright, R. (2005), Search-Theoretic Models of the Labor Market: A survey. *Journal of Economic Literature* 18, 959-988.

Rowthorn, R. (1999), Unemployment, wage bargaining and capital-labour substitution, *Cambridge Journal of Economics* 23 (4), 413-425.

Schmucker, A., Seth S. (2009), BA-Employment-Panel, 1998-2007, Codebook, *FDZ Datenreport* 1/2009, 1-123.

Smolny, W. (2009), Wage Adjustment, Competitiveness and Unemployment - Eastern Germany after Unification. *Jahrbücher für Nationalökonomie und Statistik* 229, 130-145.

Schulte, J. (2004), Arbeitslosengeld II und Arbeitslosenhilfe: Gewinner und Verlierer – Eine Schätzung der Nettoeinkommenseffekte von Hartz IV, *Diskussionsbeiträge des Fachbereichs Wirtschaftswissenschaft der Freien Universität Berlin - Volkswirtschaftliche Reihe* Nr. 2004/29, 1-18.

Spector, D. (2004), Competition and the capital–labor conflict, *European Economic Review* 48 (1), 25–38.

Topel, R. H. (1984), Equilibrium Earnings, Turnover, and Unemployment: New Evidence. *Journal of Labor Economics* 2(4), 500-522.

4.8 Data

Federal employment agency of Germany (2008), BA-Employment Panel 1998-2007, Research Data Centre (FDZ) of the Federal Employment Agency of Germany (BA) at the Institute for Employment Research (IAB*)*, Nuremberg.

4.9 Appendix

Table 10: Pooled estimations before and after the reform in Western Germany

	Men (before)	Men (after)	Woman (before)	Women (after)
Constant	**1,764*** **	**819.6*** **	**2,047*** **	**393.8*** **
	(31.94)	**(27.92)**	**(45.89)**	**(44.55)**
Age	92.98***	81.97***	114.1***	98.89***
	(1.01)	(1.14)	(1.48)	(1. 80)
Age^2	-0.94***	-0.82***	-1.25***	-1.04***
	(0.01)	(0.01)	(0.02)	(0.02)
Unskilled blue collar worker	-1,242***	-1,261***	-888.9***	-862.7***
	(2.41)	(2.43)	(3.52)	(4.01)
Skilled blue collar worker	-933.3***	-938.3***	-553.5***	-565.5***
	(2.39)	(2.47)	(6.65)	(6.92)
Foreman	-105.1***	-134.2***	-52.06	27.77
	(6.150)	(6.254)	(35.33)	(38.68)
Small firm	-197.5***	-185.3***	-258.2***	-264.1***
	(2.74)	(2.88)	(4.41)	(4.79)
Large firm	342.8***	332.7***	302.4***	307.6***
	(2.49)	(2.57)	(4.24)	(4.52)
Firm's share of young employees	-1,365***	-1,561***	-1,930***	-2,380***
	(19.13)	(21.75)	(29.79)	(36.71)
Firm's share of old employees	-208.7***	-336.4***	-345.0***	-458.9***
	(12.29)	(11.71)	(19.79)	(18.51)
Industrial-specific gross value added	-3.62***	6.89***	-16.05***	1.98***
	(0.24)	(0.093)	(0.36)	(0.20)
Job tenure	5.13***	3.55***	-5.90***	-2.85***
	(0.26)	(0.11)	(0.48)	(0.21)
2^{nd} Quarter	3.52	-19.63***	11.18**	-17.49***
	(2.75)	(2.82)	(4.69)	(5.08)
3^{rd} Quarter	2.19	-24.99***	22.61***	-12.31**
	(2.77)	(2.82)	(4.75)	(5.08)
4^{th} Quarter	5.67**	-52.27***	37.24***	-29.00***
	(2.83)	(2.82)	(4.86)	(5.09)
R^2	0.46	0.46	0.29	0.25
Obs.	510,599	492,257	177,287	168,908

Source: authors' calculation. Significance-level: 0.01(***), 0.05(**) and 0.1 Standard errors are reported in parentheses.

Table 11: Pooled estimations before and after the reform in Eastern Germany

	Men (before)	Men (after)	Woman (before)	Women (after)
Constant	**1,118*** **	**1,313*** **	**372.7*** **	**-32.22**
	(43.91)	**(52.92)**	**(58.85)**	**(69.75)**
Age	55.41***	44.16***	85.26***	88.70***
	(1.80)	(2.31)	(2.39)	(3.05)
Age^2	-0.61***	-0.45***	-0.91***	-0.89***
	(0.02)	(0.03)	(0.02)	(0.03)
Unskilled blue collar worker	-787.2***	-992.6***	-696.5***	-771.3***
	(5.96)	(6.31)	(7.05)	(7.85)
Skilled blue collar worker	-727.2***	-898.3***	-590.8***	-627.6***
	(4.91)	(5.38)	(6.81)	(7.54)
Foreman	-161.9***	-260.2***	-123.2***	-148.1***
	(13.75)	(15.89)	(43.46)	(48.72)
Small firm	-196.1***	-167.6***	-294.4***	-311.8***
	(4.39)	(4.88)	(6.57)	(7.14)
Large firm	307.3***	333.3***	293.1***	240.8***
	(5.05)	(5.48)	(6.01)	(6.57)
Firm's share of young employees	-944.4***	-1,066***	-1,383***	-1,729***
	(31.20)	(42.06)	(37.75)	(46.35)
Firm's share of old employees	-125.1***	-142.3***	-14.05	10.52
	(20.61)	(19.95)	(25.23)	(24.87)
Industrial-specific gross value added	1.64***	2.52***	-0.13	2.11***
	(0.22)	(0.10)	(0.32)	(0.16)
Job tenure	13.70***	7.18***	1.13	0.028
	(0.44)	(0.20)	(0.69)	(0.28)
2^{nd} Quarter	-7.92	-22.76***	2.58	-20.54***
	(5.14)	(5.77)	(6.71)	(7.54)
3^{rd} Quarter	-19.65***	-29.99***	4.71	-22.08***
	(5.17)	(5.78)	(6.79)	(7.54)
4^{th} Quarter	-19.39***	-51.11***	15.91**	-40.44***
	(5.32)	(5.81)	(6.98)	(7.55)
R^2	0.39	0.42	0.31	0. 26
Obs.	89,265	89,297	61,444	59,867

Source: authors' calculation. Significance-level: 0.01(***), 0.05(**) and 0.1(*).Standard errors are reported in parentheses.

Table 12: FE estimation Results for Men and Women in Eastern and Western Germany without Age Variables

	Western Germany		**Eastern Germany**	
Dependent Variable: ln Wage	men	women	men	women
Constant	7.9260***	7.762***	7.599***	7.549***
	(0.0030)	(0.0057)	(0.0061)	(0.0072)
Lower UA	**-0.0180*** **	**-0.0121*** **	**-0.0219*** **	**-0.0189*** **
	(0.0004)	**(0.0007)**	**(0.0010)**	**(0.0011)**
Unskilled blue collar worker	-0.0840***	-0.0541***	-0.0916***	-0.0655***
	(0.00259)	(0.0057)	(0.0066)	(0.0097)
Skilled blue collar worker	-0.0690***	-0.0447***	-0.0776***	-0.0611***
	(0.0024)	(0.0060)	(0.0059)	(0.0089)
Foreman	0.0032	0.0035	-0.0012	0.0365*
	(0.0037)	(0.0166)	(0.0101)	(0.0212)
Small firm	-0.0253***	-0.0247***	-0.0210***	-0.0217***
	(0.0010)	(0.0018)	(0.0021)	(0.0031)
Large firm	0.0238***	0.0217***	0.0257***	0.0128***
	(0.0010)	(0.0017)	(0.0026)	(0.0027)
Firm's share of young employees	-0.0371***	-0.0633***	0.0019	0.0065
	(0.0043)	(0.0065)	(0.0095)	(0.0117)
Firm's share of old employees	-0.0317***	-0.0523***	-0.0396***	-0.0289***
	(0.0031)	(0.0050)	(0.0063)	(0.0073)
Industrial-specific gross value added	0.0007***	0.0004***	0.0005***	0.0006***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Job tenure	0.0017***	0.0015***	0.0015***	0.0014***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
2nd Quarter	-0.0041***	-0.0037***	-0.0043***	-0.0039***
	(0.0000)	(0.0000)	(0.0001)	(0.0001)
3rd Quarter	-0.0082***	-0.0072***	-0.0091***	-0.0079***
	(0.0000)	(0.0001)	(0.0002)	(0.0002)
4th Quarter	-0.0091***	-0.00735***	-0.0094***	-0.0075***
	(0.0000)	(0.0002)	(0.0002)	(0.0003)
R^2 (overall)	0.33	0.11	0.31	0.17
R^2 (within)	0.04	0.07	0.03	0.02
obs.	4,064,672	1,403,530	728,539	491,444

The industry-specific gross value added is given annually. The result of this specification is equivalent to use of year dummy variables.

Source: authors' calculation. Significance-level: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses.

Table 13: Artificial Reforms Estimations

Dependent Variable: ln(wage)		2001 and later	2002 and later	2003 and later	2004 and later	2005 and later	2006 and later	2007 and later
Western Germany	Men	0.0168***	0.0213***	0.0266***	-0.0080***	-0.0240***	-0.0204***	-0.0153***
		(0.0001)	(0.0001)	(0.0001)	(0.0002)	(0.0002)	(0.0001)	(0.0001)
	Women	0.0278***	0.0306***	0.0248***	-0.0087***	-0.0259***	-0.0280***	-0.0266***
		(0.0003)	(0.0002)	(0.0003)	(0.0003)	(0.0004)	(0.0003)	(0.0003)
Eastern Germany	Men	0.0141***	0.0170***	0.0132***	-0.0114***	-0.0200***	-0.0134***	-0.0074***
		(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0006)	(0.0004)	(0.0004)
	Women	0.0283***	0.0321***	0.0241***	-0.0100***	-0.0271***	-0.0285***	-0.0226***
		(0.0004)	(0.0004)	(0.0005)	(0.0005)	(0.0007)	(0.0004)	(0.0005)

Source: authors' calculation. Significance-level: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses.

Table 14: FE Estimation Results for Men and Women in Eastern and Western Germany

Dependent Variable:	**Western Germany**		**Eastern Germany**	
Wage in €	men	women	men	women
Constant	524.7***	69.58*	898.1***	365.2***
L	(25.64)	(39.79)	(47.94)	(62.94)
lower UA	**-74.18*****	**-63.39*****	**-40.81*****	**-56.43*****
	(0.72)	**(1.16)**	**(1.31)**	**(1.51)**
Age	103.7***	104.2***	54.84***	67.35***
	(1.03)	(1.54)	(1.96)	(2.52)
Age^2	-1.02***	-1.00***	-0.60***	-0.63***
	(0.01)	(0.02)	(0.02)	(0.03)
Unskilled blue collar	-205.0***	-117.6***	-171.3***	-110.5***
worker	(6.73)	(11.90)	(12.68)	(15.94)
Skilled blue collar	-166.2***	-86.08***	-148.4***	-107.0***
worker	(6.341)	(13.40)	(11.84)	(14.98)
Foreman	15.65	0.17	-1.25	52.83
	(10.90)	(39.67)	(22.13)	(39.65)
Small Firm	-61.28***	-51.27***	-37.24***	-34.00***
	(2.56)	(4.48)	(4.13)	(6.07)
Large Firm	57.91***	48.82***	47.88***	22.13***
	(2.61)	(4.27)	(5.32)	(5.67)
Firm's share of young	-21.55**	-66.53***	34.36*	46.45**
employees	(10.91)	(14.94)	(18.07)	(21.61)
Firm's share of old	-61.69***	-80.16***	-47.99***	-35.11**
employees	(8.17)	(11.97)	(12.58)	(14.49)
Industrial-specific	1.21***	0.41***	1.02***	1.19***
gross value added	(0.08)	(0.15)	(0.09)	(0.14)
Job Tenure	3.31***	0.94***	3.09***	1.42***
	(0.11)	(0.19)	(0.19)	(0.25)
2^{nd} quarter	-13.94***	-10.33***	-9.570***	-8.582***
	(0.13)	(0.20)	(0.23)	(0.27)
3^{rd} quarter	-28.20***	-20.35***	-20.26***	-17.45***
	(0.19)	(0.30)	(0.35)	(0.41)
4^{th} quarter	-33.58***	-23.47***	-20.20***	-17.43***
	(0.24)	(0.38)	(0.43)	(0.51)
R^2	0.09	0.07	0.06	0.05
obs.	4,064,672	1,403,530	728,539	491,444

The industry-specific gross value added is given annually. The result of this specification is equivalent to use of year dummy variables.

Source: authors' calculation. Significance-level: *** p<0.01, ** p<0.05, * p<0.1. Standard errors are reported in parentheses

5 Expectations and Saving Behavior: An Empirical Analysis[1]

by Stefan Arent

5.1 Introduction

According to the intertemporal consumption smoothing motive, people want to smooth their consumption over their lifetimes by saving. Therefore, expectations regarding their future income levels influence the saving decisions of both individuals and households [Aaron (1999)]. Economic research has addressed this empirical question since the 1990s [e.g., Browning and Lusardi (1996), Guiso et. al. (2002), Jappelli and Pistaferri (2000)]. Both short-term and long-term uncertainties can affect households' expected incomes and therefore their savings. In the short term, households are faced with income uncertainty because of the risk of becoming unemployed; in the long term, a householder's health and retirement situation may be unknown. Hence, households save a share of their current income to ensure their future consumption. The scope of the previous empirical studies on intertemporal consumption smoothing is limited; furthermore, the evidence is mixed [see Browning and Lusardi (1996)]. The "mixed results of these studies may be at least partially attributable to the difficulty in calculating an exogenous measure" for future income uncertainty [Engen and Gruber (2001) p. 550]. At best, one would like to link information about the savings today with the expectations about income.

To date, the impact of (income) expectations on saving behavior has only been examined by a small number of studies. This paucity of research is due to the limited availability of data that contain microeconomic information regarding both individual expectations and saving behavior. Exceptions include the panel studies by Guiso et al. (2002) or Jappelli and Pistaferri

[1] An older version of this chapter is available as "Expectations and Saving Behavior: An Empirical Analysis" as ifo Working Paper Nr. 128.

(2000), which find no clear evidence for any effect of individual expectations concerning future income on the savings of Italian households. In contrast to these studies, the focus of this chapter is the variation of individual (income) expectations and their impact on savings. While former studies about the linkage of expectation and savings bases on cross section analyses, we use German panel data for this purpose. The expectations about future income are the most important factors for the saving decision. Moreover individuals should adjust their savings if their expectations vary. This relationship can only be studied using panel data in which we can observe households over time. Moreover, whereas the panel studies that were mentioned above neglected interaction effects, we consider these effects.[2] We research the issue of an individual's income expectation affects his saving decision in a panel study.

Using the German SAVE panel [Munich Center for the Economics of Aging (2011)], we examine intertemporal consumption smoothing, and we focus on the future income expectation. A simple intertemporal consumption smoothing model predicts that the higher the future income the lower the savings [e.g. Friedman (1957)] and vice versa. We can amend this by income expectations: the higher the future income expectation the lower the savings. Therefore, we analyze the impact of income expectation on how much a household saves. Although we are unable to identify a clear impact of a higher income expectation on savings, we find evidence for a negative effect of increased unemployment expectation on savings (note that a higher unemployment expectation is equivalent to a lower income expectation). Moreover, whereas we find a positive effect of the health expectation on savings in Western Germany, we find that this effect is negative in Eastern Germany. The reminder of this chapter is organized as follows: in section 5.2, we will give a brief introduction of the theoretical literature on household saving decisions. Section 5.3 describes the dataset, and

[2] Moreover, we consider the effect of a current household's situation. This consideration is necessary because the current situation of a household (for example, the health situation of its members) may affect the impact of the expectation (i.e., the income expectation) on the saving decision.

section 5.4 describes the estimation strategy. The empirical evidence is presented in section 5.5, and in section 5.6, we summarize the results and discuss the findings.

5.2 Theoretical Discussion

This section presents a simplified modification of an intertemporal consumption textbook model [such as the one in Friedman (1957)]. Subsequently, we will use a modification of this framework to formulate a testable hypothesis. Consider an individual who wants to maximize his utility over two periods, and assume that the individual can save money to transfer income into the second period.[3] The optimal level of savings (s) is given by the maximization of the time-additive lifetime utility:[4]

$$\max_s u(y_0 - s) + u(y_1 + s(1 + r)). \tag{5.1}$$

In the first period, the individual saves (s) for the second period. The first period income is y_0. The interest rate (r) is certain, and in the second period, the individual consumes both the second period's income and his savings.[5] The Euler equation follows from the maximization of equation (1), which yields the common result of the equal marginal utility of consumption in both periods:

$$u'(y_0 - s) = (1 + r)u'(y_1 + s(1 + r)). \tag{5.2}$$

Using this framework, it is easy to show that a lower second period income must be compensated by increasing savings (i.e., a higher saving rate) to equal marginal utilities. Now, consider the case of unknown second-period income, but individuals reckon with certain estimation about their mean of the future labor income $E(\widetilde{y_1})$ to optimize their savings.

[3] The borrowing constraint is binding; thus, debt is excluded in this framework and $s \geq 0$.

[4] To ease the setting, we exclude time preferences.

[5] If we normalize the income to unity, we can interpret the savings as the saving rate.

Hence, we examine whether the individuals smooth their intertemporal consumption with respect to their individual estimation of future income. Individual lifetime utility becomes the following function:

$$U(s) = u(y_0 - s) + u(E(\widetilde{y_1}) + s(1 + r)). \tag{5.3}$$

The Euler condition is modified to

$$u'(y_0 - s) = (1 + r)u'(E(\widetilde{y_1}) + s(1 + r)) , \tag{5.4}$$

and it must hold to maximize lifetime utility. Thus, savings (or the optimal saving rate) must increase whenever individuals expect a lower second-period labor income $[E(\widetilde{y_1})]$. Using the result of this model, we can formulate the following simple hypothesis.

The Income Expectation Hypothesis (IEH)

In a two-period model, if an individual certainly reckons with increasing future (labor) income, it will decrease its savings (i.e., its saving rate) until marginal utility of consumption of the present period equals the marginal utility of the future period.

We will examine the impact of a household's income and unemployment expectation on its savings. We use the German SAVE dataset to test the income expectation hypothesis (*IEH*).[6]

At this point, it should again be expressly understood that the *IEH* is a very simplified model in which uncertainty (in sense of variance) about the future income is neglected. The given data contain only information about changes of the mean expectation, not about the variance. Nevertheless variance of future income is important for the saving decision. Because of risk aversion individuals adjust their savings not only with respect to the mean of future income

[6] Because the health of an individual may also affect his saving behavior, we also consider the impact of the health expectation on savings. There is only a very small strand of literature that analyzes the effect of health (i.e. mortality) on savings [e.g., Hurd (1989)].

but also with respect to the variance [see Leland (1968) or Sandmo (1970)]. „Uncertainty about future income will reduce current consumption and increase current savings“ [see Kimball (1990) p. 68], the (strength of the) effect depends on the convexity of the utility function [see Kimball (1990)]. One should therefore keep in mind, that prudence also affects the savings decision (precautionary savings). Therefore households may increase their savings because of the uncertainty (precautionary savings) of their future income, even if the mean future income increase [Mastrogiacomo and Alessie (2013)]. Due to missing information about the variance of future income expectation we assume a certain future income expectation. Hence the rationale of precautionary savings is fading out. The *IEH* holds true in the case of certain expectations and in the case of risk neutral preferences.[7] In the following the future income expectation is assumed to be certain.

5.3 Data

This section briefly presents the German SAVE dataset, which was compiled by the Munich Center for the Economics of Aging (MEA). This dataset is a survey panel that contains data pertaining to the saving behavior of German households. The annual survey began in 2005, and the period from 2005 to 2009 will be used in our empirical analysis. One of the main features of the SAVE panel is the possibility to observe the dynamics of the saving behavior of German households. The sample size differs between 2,222 households in the year 2009 and 3,474 in 2006; 1,351 households were observed continuously between 2005 and 2009. The SAVE dataset is designed to be representative of the German population [see Börsch-Supan et al. (2009)].

[7] Nevertheless empirical results show evidence that the precautionary savings motive affects the saving rate [see Mastrogiacomo and Alessie (2013)].

The survey contains detailed information regarding individual assets and expectations, which are necessary to examine the income expectation hypothesis. In addition to general socio-economic information, such as the number of persons in each household, their ages, their marital status, their genders, the number of children, their skill levels and their employment statuses, the dataset also contains detailed information about the saving behavior, the financial situation and the expectations of the household members. The information concerning the saving behavior is notably detailed. In addition to savings and financial wealth (in €), the dataset also contains information about the reasons that households are saving (e.g., to accumulate deposits to consume or to make a provision for old age). Among other things, the SAVE panel contains financial household data regarding the labor income (and its distribution between the household members), credits, inheritances, financial gains (e.g., from the lottery), real estate wealth and tax refunds, which may also affect the saving behavior. Additionally, we add the savings (flow) by calculating the difference between the asset stocks of two periods. The asset stock is calculated net of liabilities. Furthermore, we can distinguish different types of investment, namely, short-term, medium-term and long-term investments. Whereas short-term savings are in, e.g., savings accounts, stocks and shares are types of medium-term savings and life insurance and building loan contracts are long-term savings.[8] Table 15 presents the summary statistics of the households in the dataset corresponding to the period 2005-2009.

[8] These terms are related to the temporal horizon of the investment, meaning how long it takes for the investment to mature.

Table 15: Summary Statistics of the Households [the SAVE Dataset (2005-2009)]

	Western Germany	Eastern Germany
Total Households	2 932	1 009
Average Quantity of Children*	2.21	2.26
Real Estate Owner	60.75%	43.01%
Low-Skilled (Respondent)	14.22%	7.92%
Medium-Skilled (Respondent)	63.13%	66.40%
High-Skilled (Respondent)	19.51%	23.98%
Average Household Net-Income in €	2 477.88	1 875.68
Average Annual Savings in €	6 960.38	3 093.58

Source: The author´s calculations. * If the household has at least one child.

One of the most important features of the SAVE panel is that it contains variables that measure the surveyed households' expectations. Furthermore, this panel contains income and employment data, as well as the health expectations. Moreover, the current situation of the household members is also captured. To the best of our knowledge, only the SAVE panel provides this information (in a panel dataset).

For example, the households are asked to judge the likelihood of an increase in their income in the next year, as well as the probability of becoming unemployed [see Börsch-Supan et al. (2009) p. 21].[9] Furthermore, the dataset contains valuations of the households' current health and economic situations. The range of the expectations and situation values is between 0 and 100 (in ten-point increments). Whereas a value of zero means that the household member has a negative expectation or situation and he believes that there is a 0% chance that his income will increase in the next year. A value of 100 represents a very positive situation or

[9] We interpret the income expectation as a permanent effect, a temporary effect is also possible (e.g. because of job change).

expectation.[10] Conversely, the interpretation of the unemployment expectation is exactly contrary: if a respondent is certain that he will be unemployed, the value becomes 100.

The future health expectation is calculated indirectly and in the following way: the households were asked if they expect to live longer (3), equally long (2) or shorter (1) than comparable persons in their age groups. If a person chose "longer," we can assume that this person has a better health expectation than others. Thus, we create a dummy variable that is one if the questioned member of the household expects a good future health situation (3) and zero otherwise (i.e., when the given answers are either 1 or 2).

All information is household-based. Thus, we calculate a household's expectation using the data collected from the household's members. In the cases of unemployment and income, the individual share of the household expectations is equal to the income share of each member of the household. We weighted the values thusly because we assume that the impact of an individual's expectation on the household savings decision is more important if this member of the household has a larger share of the household income. For the health expectation of the household, we calculate a dummy variable using the dummy variables of the household members (mentioned above). As before, we weighted the individual health expectation (dummy variable) of the members of the household by their incomes. The household health expectation is good (1) if the income weighted variable is greater than one.[11]

5.4 Empirical Strategy

This section presents the empirical estimation strategy. The theory predicts a negative impact from an increasing labor income expectation on savings. We develop a regression model that

[10] If the householder expects for sure an increasing income within the next 5 years the variable is 100. The income situation is rated on the same scale. A value of 100 means a very good income situation of the householder.

[11] The health situation is given by a variable between 0 and 100 (in ten-point increments), whereas a value of 100 means a very good health situation. The household health situation was calculated by using the income weighted health situations of the household members.

is based on the income expectation hypothesis (*IEH)*. The following equation represents our panel regression model[12]:

$$k_{it(j)} = \beta_0 + \beta_1 s_{y_{it}} + controls + u_{it}\ (+a_i). \qquad (5.5)$$

A household (with a subscript i) has a savings rate[13] (k) in period t, which is explained by a constant (β_0), the income expectation ***or*** the unemployment expectation (s_y) and a set of control variables; furthermore, there is an error term.[14] For each household, we calculate the household expectation variables.[15] The weight of each householder depends on her/his share of the household's net income. The control variables are as follows: the future health expectation, the current health situation, inheritances and wins (e.g. lottery) (as a share of the income), a dummy variable for real estate ownership[16], age and age squared, the number of children, the household's overall skill level, a negative health expectation variable[17] and yearly dummy variables.

To conduct a sensitivity analysis, we add several interaction terms to the control variables because it is possible that the health situations as well as the health expectations of the householders affect the impact of the income/unemployment/health expectations on savings.

[12] The results that were obtained from a pooled regression estimation are similar to the results obtained using panel regression methods.

[13] The saving rate is calculated as the share of the household's savings from its net income per year.

[14] We also run fixed-effect estimations. In this case, the saving rate is explained by an additional fixed effect term (a_i).

[15] While the panel includes the individual expectations of the household members, it only includes the overall savings of the household. Because of the household saving information, we calculate income-weighted household expectations.

[16] Because the data regarding the value of a household's real estate are only estimated by the owner, we use a dummy variable for real estate ownership. Nevertheless, estimations that use the documented value of the real estate do generate similar results.

[17] The dummy variable for a bad health expectation is calculated analogously to how the good health expectation dummy is calculated. The coefficient of this variable becomes insignificant in the great majority of specifications (44 of 48), but in most cases, the sign corroborates the good health expectation dummy variable.

For example, a person in poor health may save less money, even if he has negative income expectations. Because opposing effects are possible, the Impact of health expectations on savings is a priori less clear. To the best of our knowledge, there is no matching theory, and there is only a small strand of the literature that studies the effect of health expectations on savings in micro-based data.[18]

Finally, it is also possible that the income expectations affect savings made in distinct investment periods differently. For example, it is plausible that building loan contracts may not be reduced because of (short-term) income reduction (e.g., unemployment); in contrast, savings accounts' balances may decrease. Hence, we estimate equation (1) for short-term, medium-term and long-term savings (see section 3, investment horizon j). It seems to be necessary to consider the period of savings because the expectations of the dataset have different temporal horizons. Thus, short-run expectations (such as the unemployment expectation) may only affect the short-term saving rate.[19]

Mutual causality may pose a problem in our regressions, inasmuch as current savings affect the future income expectation. Because of that issue, we also use the expectations about the future employment situation; more precisely, we use the expected probability of becoming unemployed as an exogenous alternative for the income expectation. We employ this usage because the information about a household's future income expectation in the dataset does not differentiate between labor and capital income. Higher savings may increase the future capital income and therefore the income expectation. The saving rate should not have an impact on

[18] The findings of recent studies indicate that wealth may be associated with better self-rated health [Pollack et al. (2007)]. Thus, we can assume that a better health expectation is equivalent to a better wealth expectation. However, it is still true that no clear hypothesis about the impact of the health expectation on wealth can be formulated. For example, Zhang and Zhang (2005) examine the effect of life expectancy on savings by using cross-sectional macroeconomic data. These authors show that a higher life expectancy induces higher savings.

[19] Without any restrictions (e.g. saving contracts) a shock in the expectations should affect all savings, but many savings are bound by contracts. Therefore we differ between the temporal horizons of savings.

the probability and expectation of becoming unemployed. As a result, using the employment expectation will not induce mutual causality.

We estimate the empirical model with a focus on the future employment ***and*** income expectations of the households in Eastern and Western Germany separately. The households, and especially the income structures, differ in the two parts of Germany. The female labor market participation, and therefore their share of a typical household's net income, is much higher in Eastern Germany [Matysiak and Steinmetz (2008)]. Therefore, it may also be true that a household's saving decision and its impacts differ for this reason.[20]

We also estimate different specifications of equation (1) to avoid several problems that are common in panel regression estimations. First, we are interested in the variation over time, which induces the usage of a fixed-effect (FE) model. Nevertheless, we perform both FE and random effect (RE) estimations, and we will present both the RE and FE regression results in this paper. The Hausman-test suggests FE estimations for the majority of specifications. The use of robust estimators helps us avoid heteroscedasticity.

Finally we estimate equation (2) with two different measures of the savings.[21] We use two different methods to calculate the annual savings of the households, and the first one uses subjective amount of savings of each household. The households report their *estimated* sum of savings in the relevant period. Unfortunately, the household members often neglect dis-saving or liabilities when they estimate their savings. Furthermore, the households only estimate the sums of their savings, and the different types of investments are not accounted for separately (see section 2 for descriptions of short-term, medium-term and long-term savings). The

[20] A regression for Germany with a dummy variable representing Eastern Germany show significant differences (the dummy variable is mainly negative and significant).

[21] Furthermore, we perform a GMM estimation [see Blundell and Bond (2000)], because it is possible that the saving rate of the last period affects the current saving rate. For the great majority of specifications (14 out of 16), the saving rates of the previous period do not have a significant impact on the current saving rates.

second option is, to calculate the savings (flow) out of the change of the assets stocks between two periods. The advantage of this method is that it is more precisely and it includes dis-saving and liabilities. Moreover, we can consider capital gains (of investments) which are not use for consumption. In the following sections, we present the results of both estimation strategies with respect to the different definitions of savings in separate specifications for Eastern and Western Germany.

5.5 Empirical Results

In this section, we determine whether we can find evidence for the *IEH*. More specifically, we determine whether an increasing labor income expectation (or a decreasing unemployment expectation) leads to decreased savings. First, we present the RE and FE results for the reported (estimated) savings of the households in Eastern and Western Germany. As mentioned above, the amount of saving is only an estimation that was made by the householders themselves. We can divide the savings into *all savings* and *savings for future income* (life insurance and building loan contracts are long-term savings).[22] Table 16 summarizes the estimation results for Western Germany, and Table 17 presents the equivalent results for Eastern Germany.

[22] The householders were ask (1) how much did they save the year and (2) how much do they save for e.g. life insurance or building loan contracts.

Table 16: The Regression Results for the Estimated Savings (Western Germany)

	All Savings				Savings for Future Income			
robust	FE	RE	FE	RE	FE	RE	FE	RE
Households income	-0.0195	-0.0006			-0.0117	-0.0052		
expectation (IE)	(0.0171)	(0.0110)			(0.0085)	(0.0057)		
Households								
unemployment			-0.0019	0.0062			-0.0011	0.0006
expectation (UE)			(0.0089)	(0.0058)			(0.0050)	(0.0027)
Households health								
expectation	0.0758	0.0930	0.0249	0.0809	0.0812	0.0643	-0.0513	0.0279
Good (HEG)	(0.130)	(0.0771)	(0.0842)	(0.0625)	(0.0865)	(0.0520)	(0.0370)	(0.0266)
Hausman-test	0.40		0.04		0.06		0.01	
R^2-within	0.5343	0.5336	0.2454	0.2427	0.5435	0.5431	0.1667	0.1646
R^2-between	0.2605	0.3244	0.0359	0.1962	0.2079	0.2300	0.0683	0.1569
R^2-overall	0.4860	0.5182	0.1348	0.2599	0.5004	0.5091	0.1354	0.1900
Observations	8169		3742		9776		5349	
Controls	heritages, wins etc. (income share); real estate ownership; age and age square (interviewee); children; skill level (interviewee); each year's dummy variable; interaction terms (income/unemployment expectation and health expectation, as well as health situation and expectation)							

Source: the authors' calculations. The significance-levels: 0.01(***), 0.05(**) and 0.1(*). Standard errors are reported in parentheses below the coefficients.

Table 17: The Regression Results for the Estimated Savings (Eastern Germany)

	All Savings				Savings for Future Income			
robust	FE	RE	FE	RE	FE	RE	FE	RE
Households income expectation (IE)	0.00389	0.00541			-0.000495	-0.000257		
	(0.00448)	(0.00590)			(0.00205)	(0.00155)		
Households unemployment expectation (UE)			-0.0140**	-0.00243			0.00259	0.000371
			(0.00567)	(0.00284)			(0.00213)	(0.00113)
Households health expectation Good (HEG)	-0.0803	-0.00881	0.0325	0.0305	-0.0306**	-0.0126	-0.0147	0.00715
	(0.0798)	(0.0306)	(0.0996)	(0.0444)	(0.0129)	(0.0110)	(0.0284)	(0.0160)
Hausman-test	0.00		0.01		0.12		0.00	
R^2-within	0.1133	0.1082	0.3495	0.3350	0.0291	0.0260	0.1439	0.1340
R^2-between	0.4190	0.4968	0.8026	0.8453	0.0106	0.0366	0.0088	0.0276
R^2-overall	0.1545	0.1866	0.5484	0.5832	0.0158	0.0308	0.0267	0.0744
Observations	3052		1257		3731		1936	
Controls	heritages, wins etc. (income share); real estate ownership; age and age square (interviewee); children; skill level (interviewee); each year's dummy variable; interaction terms (income/unemployment expectation and health expectation, as well as health situation and expectation)							

Source: the authors' calculations. The significance-level: 0.01(***), 0.05(**) and 0.1(*). Standard errors are reported in parentheses below the coefficients.

The results presented in Table 16 and Table 17 do not confirm the hypothesis of the model, which posited that people with decreasing income expectations would save more money. For Western Germany, we are unable to find significant results for the theoretical propositions when using the estimated real savings that were reported by the households. In fact, in Western Germany, we cannot uncover significant results. For Eastern Germany, we find only two significant estimators for the unemployment and health expectations. We find notably weak evidence that if Eastern German households have good future health expectations, they reduce their saving rates for the purposes of life insurance and building loan contracts. Furthermore, a higher unemployment expectation seems to decrease the saving rate.

In general, the R^2 of the regressions, and therefore their quality, is relatively high. Nevertheless, the results should be interpreted with caution. The reported values of the savings are estimations by the householders (the interviewees). To draw a more detailed picture, we will now present results for alternative specifications, that is, the results for the absolute changes in assets stocks between two periods. These values are based on the financial data of the households (i.e., the data that are not estimated by the householders themselves). Furthermore, the assets (savings) can be divided into short-, medium- and long-term categories. In general, this specification should lead to more valuable results. Table 18 and Table 19 summarize the regression results for Western Germany and Eastern Germany, respectively.[1]

[1] The skill level is excluded because it was insignificant under every specification.

Table 18: The Regression Results for Changes in Asset Stock = Savings (Western Germany)

	All Savings				Short Savings			
robust	FE	RE	FE	RE	FE	RE	FE	RE
Households income expectation (IE)	**-0.102*** **(0.0559)**	**-0.0981**** **(0.0481)**			-0.0293 (0.0288)	-0.0086 (0.0166)		
Households unemployment expectation (UE)			-0.0618 (0.0430)	-0.0174 (0.0256)			**-0.0339**** **(0.0166)**	**-0.0200**** **(0.0099)**
Marginal Effect Interaction UE x HGE							-0.00002 0.00014	
Households health expectation Good (HEG)	0.662 (0.832)	0.211 (0.381)	1.479* (0.821)	0.380 (0.360)	0.147 (0.190)	0.129 (0.119)	0.194 (0.258)	0.148 (0.115)
Marginal Effect Interaction Health situation x HGE			1.3465 (0.7225)					
Hausman-test	0.66		0.58		0.28		0.99	
R^2-within	0.0500	0.0487	0.0065	0.0029	0.0832	0.0814	0.0079	0.0048
R^2-between	0.0173	0.0534	0.0000	0.0087	0.0285	0.0600	0.0001	0.0082
R^2-overall	0.0356	0.0532	0.0001	0.0048	0.0652	0.0811	0.0008	0.0065
Observations	6859		3128		6859		3128	
Controls	heritages, wins etc. (income share); real estate ownership; age and age square (interviewee); children; skill level (interviewee); each year's dummy variable; interaction terms (income/unemployment expectation and health expectation, as well as health situation and expectation)							

	Medium Savings				Long Savings			
robust	FE	RE	FE	RE	FE	RE	FE	RE
Households income	-0.0327	-0.0150			-0.0081	-0.0591		
expectation (IE)	(0.0206)	(0.0114)			(0.0240)	(0.0415)		
Households unemployment			-0.0231	-0.0114			0.0032	0.0189
expectation (UE)			(0.0147)	(0.0130)			(0.0361)	(0.0242)
Households health								
expectation	0.410*	0.186**	0.553	0.103	0.484	0.071	1.082	0.208
Good (HEG)	(0.244)	(0.093)	(0.655)	(0.203)	(0.795)	(0.362)	(0.704)	(0.284)
Marginal Effect								
Interaction Health	0.4778							
situation x HEG	(0.5578)							
Hausman-test	0.67		0.19		0.75		0.50	
R^2-within	0.0046	0.0031	0.0083	0.0030	0.0214	0.0202	0.0063	0.0023
R^2-between	0.0002	0.0062	0.0001	0.0072	0.0065	0.0208	0.0000	0.0073
R^2-overall	0.0000	0.0030	0.0003	0.0029	0.0128	0.0219	0.0003	0.0039
Observations	6859		3128		6859		3128	
Controls	heritages, wins etc. (income share); real estate ownership; age and age square (interviewee); children; skill level (interviewee); each year's dummy variable; interaction terms (income/unemployment expectation and health expectation as well as health situation and expectation)							

Source: the authors' calculations. The significance-level: 0.01(***), 0.05(**) and 0.1(*).Standard errors are reported in parentheses below the coefficients.

As in the former setting (estimated savings), the impact of the expectation is not significant when we use the changes in assets stock (=savings). We are not able to confirm the *IEH*. Nevertheless, in Western Germany, we find a significant impact of the expectation variables when we use these different settings. A possible explanation for these results may be the more precise data about the net savings. In every setting, the Hausman-test recommends the use of the RE estimations.

For Western Germany, the results for the income and unemployment expectations are ambiguous (see Table 18). The estimation that uses the income expectation to explain the overall saving rate seems to confirm the *IEH*. We find evidence that an increasing income expectation decreases the savings (i.e., the saving rate). If the household expects a higher income (1%), the saving rate decreases by approximately 0.10 percentage points (pp) (Table 18, column 3). However, the regression in which mutual causality is excluded does not confirm this finding. Western German households decrease their short-term saving rate by about -0.03 pp if they expect a higher probability (1%) of becoming unemployed (also equal to a lower income expectation) (Table 18, column 9). This result is in contrast to the expectations of the simple *IEH*. If we consider the interaction between the unemployment and health expectations, the marginal effect becomes insignificant. Thus, the unemployment expectation does not affect the short-term saving rate of a household with a good health expectation, but this expectation does affect a household with a normal health expectation (-0.03 pp).[1]

Two possible reasons may explain the different results that were obtained for the income and unemployment expectations. First, the use of the income expectation may induce mutual causality (see section 4). Second, German labor market legislation may affect the saving

[1] The interaction's effect is shown graphically in the Appendix (Figure 19). The marginal effects were only calculated for the specification that the Hausman-test suggests.

decision. If a person becomes unemployed, he has to liquidate his savings (in particular, short-term savings and long-term savings are secured by the legislation) down to a personal allowance before he can request unemployment benefits. Thus, the negative effect may result from this labor market legislation. If householders expect unemployment, they may dis-save their short term savings.[2]

The medium and long-term saving rates are not affected by the income and unemployment expectations. This phenomenon is also observed in Eastern Germany (see Table 19). We can provide two explanations for these findings. First, the dataset contains the income and unemployment expectations for one year, which makes them "short-term" expectations. Medium- and long-term savings are often bound by contracts. Thus a variation of this savings often needs time and money. It is much easier to adapt short-term savings like savings accounts. Second, the German labor market legislation secures long-term savings if someone becomes unemployed. Thus, (short-term) unemployment does not endanger (old-age) income by forcing the liquidation of private savings.[3] Both facts provide a plausible explanation for the reaction of only the short-term saving rate.

We will now take an additional look at the health expectation and the health situation in Western Germany. We find weak evidence that a good health expectation increases the medium-term saving rate (+0.17 to +0.41 pp) of households. If we consider the current health situation, the impact always becomes insignificant (see Figure 20 in the Appendix).

[2] Engen and Gruber (2001) and Hubbard et al. (1994) find a similar effect by using proxies for the probability of unemployment (instead of the individual unemployment expectation).

[3] In the case of long-term unemployment private savings reduce the claim of benefit, but there is also an amount of exemption for savings (especially for pension plans).

Table 19: The Regression Results for Changes in Asset Stock = Savings (Eastern Germany)

	All Savings				Short Savings			
robust	FE	RE	FE	RE	FE	RE	FE	RE
Households income	0.0879	0.0559			0.0166	0.00847		
expectation (IE)	(0.0714)	(0.0483)			(0.0218)	(0.0126)		
Households unemployment			0.148	0.0307			0.0657	0.0231
expectation (UE)			(0.186)	(0.0797)			(0.0632)	(0.0235)
Households health								
expectation	-0.739	0.0361	-1.930*	-1.234**	-0.286**	-0.151	-0.161	-0.0911
Good (HEG)	(0.679)	(0.521)	(1.080)	(0.557)	(0.141)	(0.109)	(0.206)	(0.105)
Marginal Effect								
Interaction Health			-1.6608					
situation x HGE			(0.9581)					
Hausman-test	0.55		0.09		0.96		0.73	
R^2-within	0.0063	0.0029	0.0436	0.0329	0.0054	0.0036	0.0167	0.0104
R^2-between	0.0005	0.0001	0.0000	0.0284	0.0001	0.0128	0.0235	0.0504
R^2-overall	0.0002	0.0018	0.0129	0.0278	0.0012	0.0044	0.0072	0.0137
Observations	2726		1109		2726		1109	
Controls	heritages, wins etc. (income share); real estate ownership; age and age square (interviewee); children; skill level (interviewee); each year's dummy variable; interaction terms (income/unemployment expectation and health expectation, as well as health situation and expectation)							

	Medium Savings				Long Savings			
robust	FE	RE	FE	RE	FE	RE	FE	RE
Households income	0.0314	0.0049			0.0454	0.0353		
expectation (IE)	(0.0593)	(0.0216)			(0.0575)	(0.0433)		
Households unemployment			-0.0163	0.0036			-0.0289	-0.0471
expectation (UE)			(0.0334)	(0.0153)			(0.0671)	(0.0524)
Households health								
expectation	0.466	0.748	0.172	0.0815	-0.769	-0.319*	-1.497	-1.105**
Good (HEG)	(0.463)	(0.705)	(0.145)	(0.0703)	(0.483)	(0.188)	(0.977)	(0.535)
Hausman-test	0.99		0.59		0.40		0.99	
R^2-within	0.0021	0.0012	0.0187	0.0097	0.0110	0.0079	0.0079	0.0052
R^2-between	0.0005	0.0242	0.0045	0.0203	0.0001	0.0057	0.0029	0.0332
R^2-overall	0.0006	0.0079	0.0010	0.0110	0.0008	0.0071	0.0012	0.0115
Observations	2726		1109		2726		1109	
Controls	heritages, wins etc. (income share); real estate ownership; age and age square (interviewee); children; skill level (interviewee); each year's dummy variable; interaction terms (income/unemployment expectation and health expectation as well as health situation and expectation)							

Source: the authors' calculations. The significance-level: 0.01(***), 0.05(**) and 0.1(*). Standard errors are reported in parentheses below the coefficients.

The results obtained in Eastern Germany are different from the results in Western Germany (see Table 19). Again, we focus on the FE estimations for all specifications. In Eastern Germany, we could not find any impact of short-term expectations on the saving rates. With respect to the long-term health expectation, we find a significant negative impact of a good health expectation on the overall saving rate in Eastern Germany. In contrast to Western Germany, Eastern German households with a good health expectation have a 1.3 to 1.9 pp lower saving rate than households with an average health expectation, but this effect becomes insignificant if we consider the health situation.[1]

If we compare the results of Table 16 and Table 18 (respectively, Table 17 and Table 19), we see that regressions of the first approach (Table 16 and Table 17) have a much greater explanatory power (R^2) but less significant coefficients. The critical interpretation of both settings leads to the following result: we cannot confirm the *IEH* from the textbook model if we consider all of the results. In contrast to the *IEH,* we find evidence that Western German households reduce their short-term saving rates if they expect lower incomes as a result of potentially becoming unemployed.[2] The crowding out of private savings because of social benefits may be responsible for this.

5.6 Conclusions

This chapter analyzes the impact of certain expectations on the saving behavior of households. In contrast to former studies, we use panel data that was collected from German households, which contain information concerning the surveyed individuals' income expectations, as well as detailed information regarding these individuals' savings. We develop

[1] See the Appendix (Figure 21).

[2] In Eastern Germany, we do not observe any significant impact of the income or unemployment expectations on the saving rates. The health expectation has different impacts in Eastern and Western Germany, but it becomes insignificant if we consider the interaction with the health situation.

an income expectation hypothesis that is based on the textbook model, whereupon a certain lower future mean income (expectation) should always increase households' savings. By examining the impact of individual income and unemployment expectations on savings, we find evidence in Western Germany that a lower income expectation increases the overall saving rate. This result cannot be confirmed using the unemployment expectation, which would be necessary to exclude mutual causality. If we use the unemployment expectation, we find that an increasing unemployment expectation, which is equivalent to a lower income expectation, decreases the short-term saving rate in Western Germany for households with an average health expectation. Thus, our results are in line with the mixed evidence of the studies on this topic [Jappelli and Pistaferri (2000)]. German legislation concerning the labor market is a possible reason for the results in Western Germany.[3] The unemployed have to liquidate their short-term savings down to a given level before they can apply for unemployment benefits. Hence, our result partly supports the findings of Engen and Gruber (2001), as well as Hubbard et al. (1994). Both papers find a negative impact of social security systems on savings. In contrast to these studies, we use individuals' expectations regarding their future income and unemployment probabilities. Nevertheless, our results corroborate theirs.

Our analysis shows evidence that the individual short-term unemployment expectation affects short-term savings. Furthermore, we cannot find evidence that if we consider the health situation, medium-term and long-term health expectations have a significant impact on the medium-term and long-term saving rates of German households. Both expectations can distort the saving decision. Thus, exogenous shocks in either the labor market (expectations) or in the health (expectations) may affect the savings rates and therefore capital markets and investments. As a consequence, social security systems can avoid contagion effects. For

[3] Lusardi (1997) points out, that "the existence of institutions (…) which potentially allow households to insure against income risk (…) should not be overlooked. The mere existence of these institutions can provide evidence per se that it is very important to avoid income risk" [Lusardi (1997) p. 325].

example, if a society prefers flexible labor markets, (relatively) high short-term unemployment benefits (e.g., Denmark) can increase the (labor) income expectation and therefore its impact on savings. The same finding is observed for the health care system, which may reduce uncertainty about future health.[4]

Future theoretical research may answer the question of how health expectations affect savings decision. Moreover, it is still unclear if the impact of income expectations on savings behavior depends on the social security system. First, empirical studies find evidence that social security systems have a strong negative effect on private savings [see Alessie et al. (2012)]. All of the theoretical and empirical studies focus on the effect of a change in the future mean income (e.g., due to unemployment) on savings with respect to taxes and transfer systems, but the impact of income risk (in the sense of income variance) is both empirically and theoretically unclear.[5]

[4] Former studies show that "the introduction of social health insurance can substantially reduce uncertainty about out-of-pocket health expenditures, and thus reduce households' precautionary-saving motive (…) and increased their consumption when the comprehensive health insurance became available" [Chou et al. (2003) p 1 892].

[5] Arent et al. (2012) discuss the effects of taxes and transfers on the impact that labor income risk has on savings.

5.7 References

Aaron, H. J. (1999), Behavioral dimensions of retirement economics, Brookings Institution Press 1999, Washington D.C. (USA).

Alessie, R., Knoef, M., Been, J., Caminada, K., Goudswaard, K. and Kalwi, A. (2012), Retirement savings adequacy in the Netherlands, MIMEO, Leiden University.

Arent, S., Eck, A., Kloss, M. and Krohmer, O. (2012), Income Risk, Saving and Taxation: Will Precautionary Saving Survive?, ifo working paper No. 125.

Berger, L. (2014), 'Precautionary saving and the notion of ambiguity prudence',*Economics Letters 123 (2)*, 248–251.

Blundell, R. and Bond, S. (2000), GMM Estimation with Persistent Panel Data: An Application to Production Functions, *Econometric Reviews* 19 (3), 321-340.

Börsch-Supan, A., Coppola, M., Essig, L., Eymann, A. and Schunk, D. (2009), The German SAVE study - Design and Results, The German SAVE study - Design and Results (MEA), Max-Planck-Instituts für Sozialrecht und Sozialpolitik, Munich, Germany.

Browning, M. and Lusardi, A. (1996), Household saving: Micro theories and micro facts, *Journal of Economic literature* 34, 1797-1855.

Chou, S. Y., Lui, J. T. and Hammitt, J. K. (2003), National Health Insurance and Precautionary Saving: Evidence from Taiwan, Journal of Public Economics 87, 1 873-1 894.

Eeckhoudt, L. and Schlesinger, H. (2008), Changes in Risk and the Demand for Savings, *Journal of Monetary Economics* 55 (7), 1 329-1 336.

Engen, E. M. and Gruber, J. (2001), Unemployment Insurance and Precautionary Saving, *Journal of Monetary Economics* 47, 545-579.

Friedman, M. (1957), A Theory of Consumption Function, Princeton University Press, Princeton, USA.

Guiso, L., Jappelli, T. and Terlizzese, D. (2002), An Empirical Analysis of Earnings and Employment Risk, *Journal of Business and Economic Statistics* 20 (2), 241-253.

Hubbard, R. G., Skinner, J. and Zeldes, S. P. (1994), The Importance of Precautionary Motives in Explaining Individual and Aggregate Saving, *Carnegie-Rochester Conference Series on Public Policy* 40 (1), 59-125.

Hurd, M. (1989), Mortality Risk and Requests, *Econometrica* 57, 779–814.

Jappelli, T. and Pistaferri, L. (2000), Using Subjective Income Expectations to Test for Excess Sensitivity of Consumption to Predicted Income Growth, *European Economic Review* 44, 337-358.

Lusardi, A. (1997), Precautionary Saving and Subjective Earnings Variance, *Economics Letters* 57, 319-326.

Lusardi, A. (1998), On the Importance of the Precautionary Saving Motive, *The American Economic Review* 88 (2), 449-153.

Mastrogiacomo, M. and Alessie, R. (2013), 'The precautionary savings motive and household savings', *Oxford Economic Papers 66 (1)*, 164-187.

Matysiak, A. and Steinmetz, S. (2008), Finding Their Way? Female Employment Patterns in Western Germany, Eastern Germany, and Poland, *European Sociological Review* 24 (3), 331-345.

Kimball, M. S. (1990), 'Precautionary Saving in the Small and in the Large', *Econometrica* 58 (1), 53-73.

Leland, H. E. (1968), 'Savings and Uncertainty: The Precautionary Demand for Saving', *Quarterly Journal of Economics* 82 (3), 465-473.

Pollack, C. E., Chideya, S., Cubbin, C., Williams, B., Dekker, M. and Braveman, P. (2007). Should Health Studies Measure Wealth? A Systematic Review, *American Journal of Preventive Medicine* 33 (3), 250-264.

Sandmo, A. (1970), 'The Effect of Uncertainty on Saving Decisions', *Review of Economic Studies 37*, 353-360.

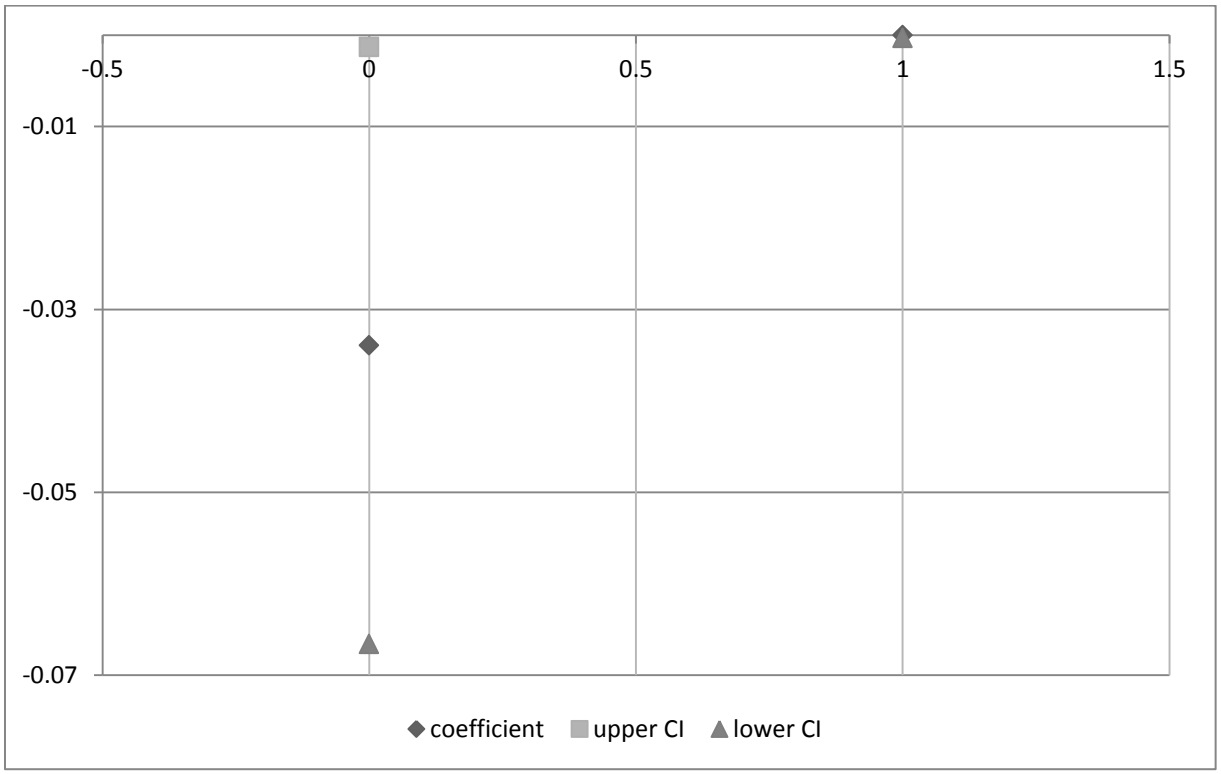
Zhang, J. and Zhang, J. (2005), The Effect of Life Expectancy on Fertility, Saving, Schooling and Economic Growth: Theory and Evidence, *The Scandinavian Journal of Economics* 107 (1), 45–66.

5.8 Data

Munich Center for the Economics of Aging (2011), 'Saving and Financial Investment of Private Households (SAVE) 2001-2009', Max-Planck-Instituts für Sozialrecht und Sozialpolitik, Munich, Germany.

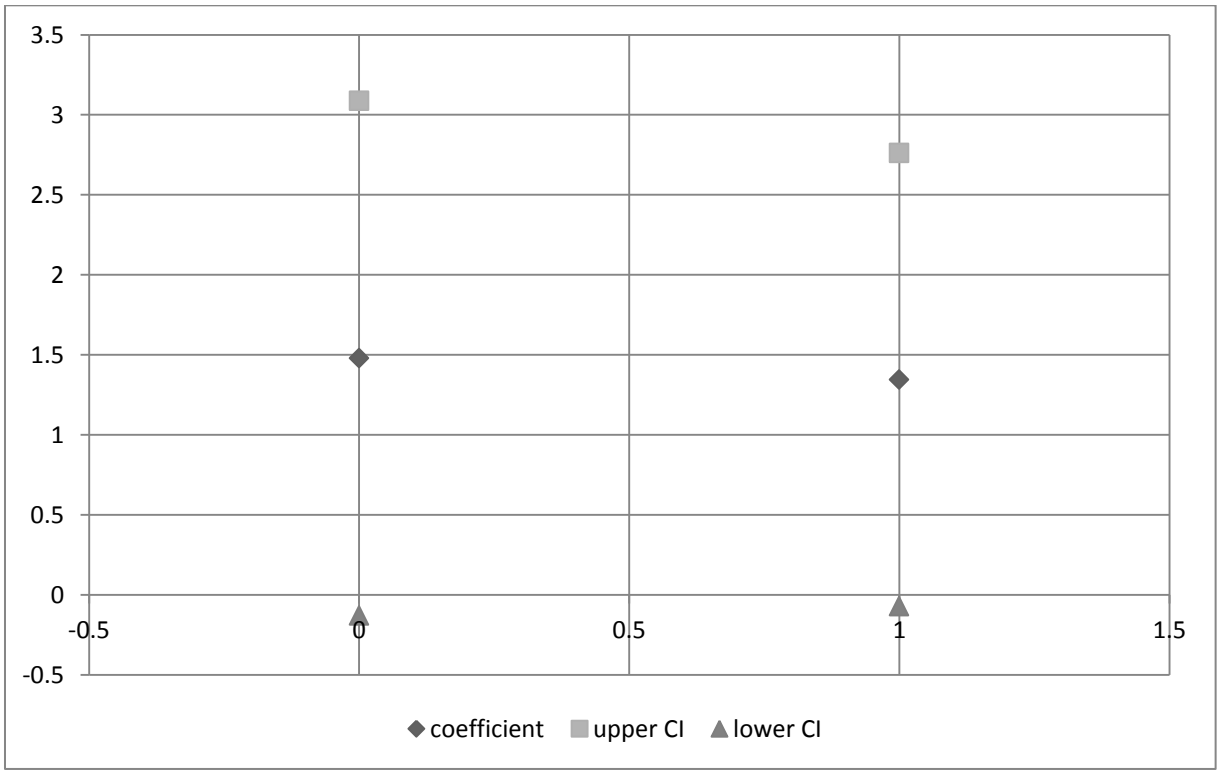
5.9 Appendix

Figure 19: Marginal Effect of the Unemployment Expectation on the Short-term Saving Rate, Considering Health Expectation (Western Germany)



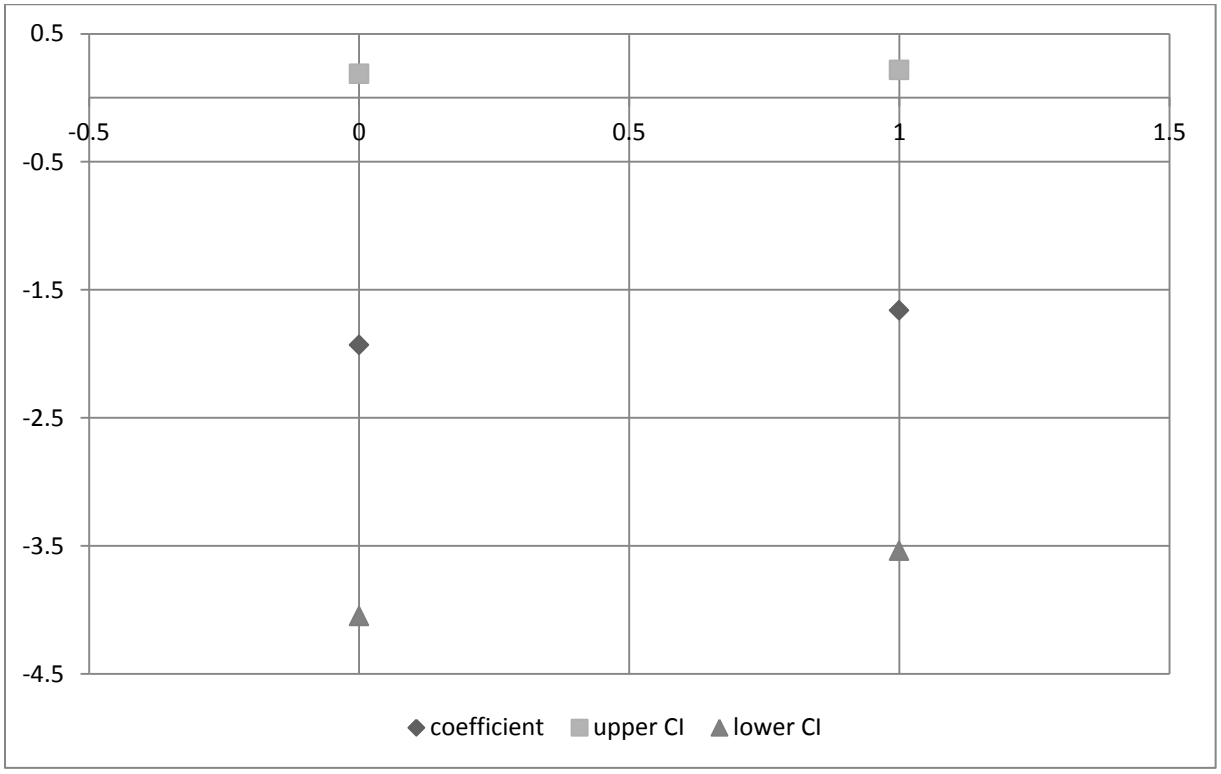
Source: authors' calculations. CI=95% confidence interval. The coefficient is always negative and significant.

Figure 20: Marginal Effect of the Health Expectation on the Medium-term Saving Rate, Considering Health Situation (Western Germany)



Source: authors' calculations. CI=95% confidence interval.

Figure 21: Marginal Effect of the Health Expectation on the Medium-term Saving Rate, Considering Health Situation (Eastern Germany)



Source: authors' calculations. CI=95% confidence interval.